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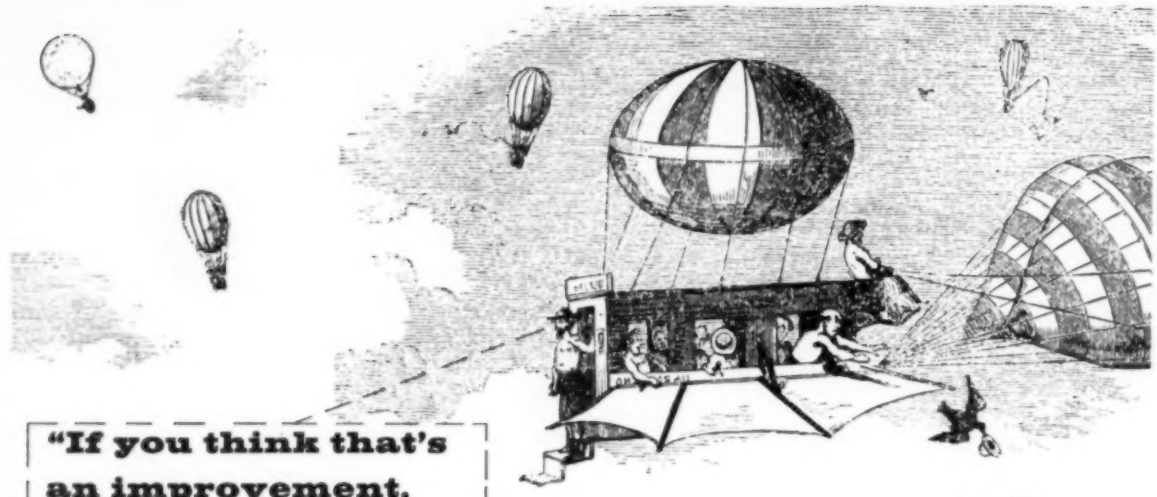
July, '59

INDUSTRIAL QUALITY CONTROL

QUALITY through Scientific Methods

Report of the Thirteenth Annual Convention

JOURNAL OF THE AMERICAN SOCIETY FOR QUALITY CONTROL



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Quality to Meet the Demands of Space: A Challenge to ASQC for Quality Control

Dr. Edward R. Sharp 9

This article spells out the important and challenging role that QC must take in this newest of new ages, the space age. The obvious vastness of space itself is analogous to the vastness of the quality control role. Luncheon address at the Thirteenth Annual Convention.

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A Note on ANOVA in the Transistor Industry

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A previous article by Messrs. Wortham and Anderson has brought forth several illuminating comments. These comments are presented here with a discussion by the authors of the original article.

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From the President's Desk

A Look Forward

Once again our Society starts a new year in the knowledge that it is a vigorous, enthusiastic group of determined Quality Control people. The prospects for the future are bright, with respect to both the coming months and the years ahead. This happy situation is not the result of wishful thinking, but stems from the combined efforts of the many members of the Society who have contributed so unselfishly to our progress.

In the recent past we have been able to detect evidence of approaching maturity of the Society, a decided shift from the initial enthusiasm for something new to a purposeful determination to expand the frontiers of Quality Control and to develop the science for the advancement of the industrial welfare of our country. We see evidence of the crystallization and solidification of the "hard core" of our Society, so necessary for the long-term progress, even existence, of a professional technical organization. There begins to emerge a wider understanding and acceptance of the objectives we have set for ourselves and a greater devotion to the purposes for which we are organized. We see evidence of a general rise in the level of technical sophistication of our membership, certainly a trend to be developed and encouraged.

On what basis do I make such statements as these? During the past year it has been my pleasure, and indeed it has been a pleasure, to meet with many groups—Sections, Divisions and Committees —and to discuss Quality Control with them, both in terms of the programs they are advancing in industry and their Society activities. The substantial contributions that have been and are being made by the members working together in these groups are very real and I claim for the Society no small credit for providing the climate and encouragement for such activity. One merely had to observe committee activity, as it was my privilege to do at our Convention in Cleveland in May, to be convinced of the tremendous effort being put forth by many members of our Society and to learn of the progress through group action that has been made and is planned for the future.

Certainly there is evidence of increasing maturity in the area of professional development. While much remains to be done, certain of the courses are charted and an organizational structure provided in which the very necessary programs can be carried on. Continuing efforts to expand and improve our publications are being made and I am sure that these efforts will be increasingly reflected in real benefits to the members of the Society. In the area of education, significant steps have been taken, as evidenced by the Management Workshop at Cleveland, and those active in this work have definite plans for further expansion of such activities. Of necessity, such programs require time to develop and while the coming months will see substantial progress, even greater gains will be evident in the next few years.

The Society's business and financial operations have improved substantially and are stable; there is every reason to believe that the Society will operate with a slight net favorable balance in the coming year, as it did in the past twelve months. Growth in terms of number of members is expected to continue. At the risk of appearing to over-emphasize this facet of our Society life, I wish to point out the need for continued expansion, the bringing in of new people in our efforts to expand the influence of Quality Control in industry as well as to enhance the total body of knowledge of the science through the contributions these new people can make. In our expanding economy, growth is essential if we are to keep pace with the times. I urge each member to exert personal influence in bringing into the Society people who can contribute to our total effort and who wish to be counted among those who are advancing the science of Quality Control.

Finally, I urge the active participation of every member in the affairs of the Society. We need more committees, more sub-committees and more task groups to explore and study many of the uncharted areas of Quality Control. Real progress can be made by working in small groups on specific tasks and I encourage this kind of activity within the Society, its Sections and its Divisions. Where the need for coordination is ultimately exhibited, it will be forthcoming.

I look forward to a most enjoyable year working with you in Society affairs and I wish each of you every success in your personal endeavors.

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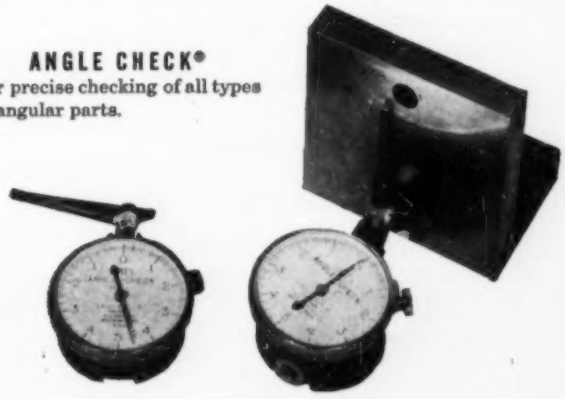

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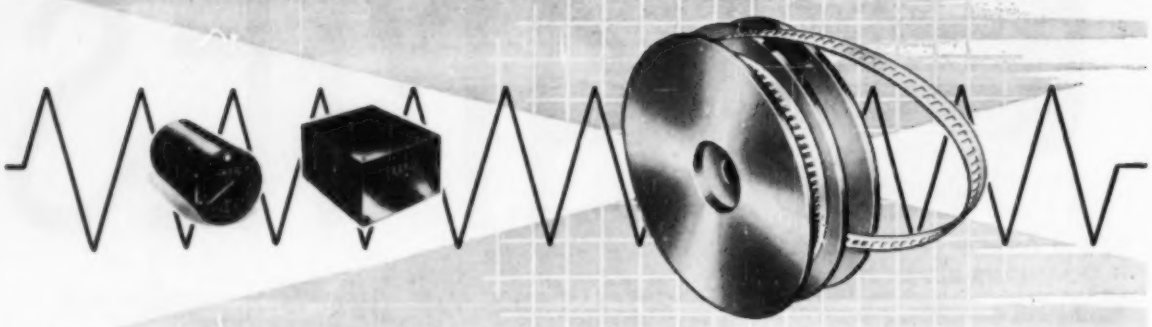

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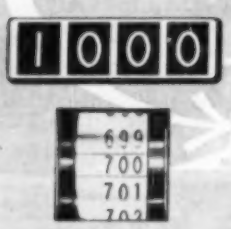

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Theory, Communication, Application

IRVING W. BURR

Purdue University, Lafayette, Ind.

The 1958 Shewhart Medalist

Irving W. Burr

I want to convey my most humble and hearty thanks to the Society and all its members for this honor being done me tonight. It is a great feeling to receive the highest award of any professional society, but especially so when that society contains such a multitude of one's warmest friends. Any deserving I may have for this honor must be in large part due to my teachers, among whom are Professor Cecil Craig, last year's Shewhart Medalist, and Professor Harry Carver, both of the University of Michigan, my many professional colleagues in statistics, and all of my industrial friends and associates, my teachers of the subject "Industry," and finally my wonderful wife.

I have given much thought as to what I should like to discuss with you tonight. What I wish to say can be classified under the three general headings of theory, communication and application.

As I attend meetings of organizations such as the Institute of Mathematical Statistics and the American Statistical Association, I see two rather distinct kinds of theory being developed. These I classify as to being more, or less, far from practical application. On the one extreme we have the purest-of-the-pure mathematician or probabilist whose goal is abstraction and generality with almost no thought whatever of application. Such a mathematician once said "and thank heaven this theorem can never have any application." At the other extreme is the statistician who works directly with the man making applications in industry or research, helping him solve the theoretical problems arising in the work. My own interests and sympathy are with the latter group of statisticians. I know that we must have both groups working in this country, but in watching the development of statistics over the past 30 years, I have noticed a growing tendency toward the abstract and theoretical, with disdain for numerical data or any practical problems. This trend has even been encouraged by colleges and universities in their scales of monetary rewards and prestige. To me this is most unfortunate, and a trend to be combatted. Its fruit can be seen in many foreign countries in which there is an enormous gulf between the applied person and the theorist in the university. In the American Society for Quality Control we have been signally successful in avoiding this gap. Our short courses for training the industrial man in statistical quality control have set a pattern which is beginning to be copied in other countries and in other scientific areas.

So I summarize by saying that we should strive, as ever, to keep our research workers and teachers close to those who are facing problems and making the daily applications, and to encourage and foster research grounded in applications. I call it "applicational research." The vigorous, healthy and enormous growth of statistical methodology has in large part stemmed from just such association.

1958 Shewhart Medal Citation

The 1958 Shewhart Medal is awarded to Dr. Irving W. Burr in recognition of his many contributions to statistical quality control as a pioneer in the teaching of statistical principles to men in industry; as a scientist who has interested students and colleagues in the study of statistics; as a contributor of articles to various journals; as an author of a textbook widely used in educational institutions; as a member of the Editorial Board and the Standards Committee; as an officer, lecturer, and advisor to individual sections; and as a participant in Regional Conferences and National Conventions of the American Society for Quality Control.

The second phase of our work is that of communication. This is both the problem of the teacher in "getting it across" and that of two or more persons getting to understand each other anywhere. Thus we have the job of "bridging the gap." I have no patience with the teacher or professor who speaks of his "dummies." He is exactly analogous to the card player who always has "poor cards." Neither one knows how to get the most out of what the Lord provides him with! As teachers (and most of you do teach others some quality control at one time or another) we need (1) to know our subject thoroughly, (2) to have enthusiasm for it; that is, to be convinced of its value and importance, and (3) to be able to explain it well, including examples and applications.

Good communication in the class room, meeting, or on the shop floor is always a two-way proposition; each of two people have to stretch toward the other one. Most problems of communication arise from people underestimating the gap in understanding between themselves and those with whom they work. In fact, it is rare, indeed, for us to overestimate the gap, and hence we must do everything possible to close it. One of the most important things one can do is to try to broaden one's self in every possible way. Another is to try to give time for understanding of, say, statistical quality control to grow, perhaps months or even years. Thinking statistically does not come naturally and certainly is not stressed in most formal education at present.

Some of the things all teachers of statistics can do to improve communication are (1) to deliberately leave out some of the fine points in an effort to leave the total picture clear (such fine points are often put in for the sole purpose of avoiding criticism from other experts), (2) to use simple, consistent and accurate notation, (3) to use numerical examples, especially at the introduction of a topic, (4) to use graphs, slides and experiments, (5) to keep as many of an audience with you as long as possible by a simple straight-forward approach, leaving the more difficult parts to the end of a talk, (6) watching carefully the reactions of those you talk to, and (7) selling continually but judiciously.

The third general phase of our work is application. I wish to discuss one part only, but a part in which we can make a lot of progress.

In September 1957, at the American Statistical Association at Atlantic City, some seven of us at dinner got into a rather violent discussion of Franklin Satterthwaite's controversial Random Balance technique.* Some were outspoken opponents of it, being unable to see any good to it. Others could see real possibilities to it and had in fact made good use of it. The only way to reconcile the discussants and to make progress was to try to find the area of usefulness of the technique. Just when is it good, and when is something else much better? I felt justified in pointing out certain situations in which it could possibly be the best available statistical technique, in particular where there is one, or possibly two overwhelmingly strong assignable causes among ten or 15, and these one or two are much stronger than chance variation. If in practice the situation proves to be thus, fine, we are away ahead by using the method. But if not, then we have not lost too much, and we try other methods, using new data and anything we can salvage out of the old. The proponents of Random Balance have been at work experimenting, applying and trying to widen this area of usefulness.

What it seems to me we should try to do is to seek out the areas of usefulness of all of our statistical techniques. In fact, I should like to see us reverse this procedure and try to classify all of the problems of physical, engineering and industrial science into some order, involving such things as relative strength of assignable and chance causes, number of suspected assignable causes, types of data and distributions involved, economic factors such as cost of a single measurement, cost of materials, and cost of computation, physical limitations, such as, rate at which data can be generated, and finally the kinds of answers we want, such as, estimation and confidence limits, prediction, significance testing, and decision making. It seems highly probable to me, that when we try to structure the whole aggregate of problems in this manner, we will find sizeable areas which have been virtually untouched and for which we need new statistical tools. I hope that some of our future work at Purdue may take this direction. The job of structuring all problems and finding the best statistical tools for them can doubtless never be completed, but much can be gained by trying.

Finally, I wish to emphasize the close interrelation that should exist between theory, communication (the connecting link), and application. Theory can be greatly stimulated by close contact with application, and application flourishes when closely aided by research workers. This cooperation can work to the profit of all of us.

Again I want to say how deeply grateful I am to all of you for the honor given me tonight.

*Budne, Thomas A., "Random Balance: Part I—The Missing Statistical Link in Fact Finding Techniques; Part II—Techniques of Analysis; Part III—Case Histories," *Industrial Quality Control*, Vol. XV, No. 10-11-12, Apr.-May-June, 1959.

Philadelphia Section Presents 4th Annual Quality Control Symposium

On Sept. 11 the 4th annual symposium on quality control methods and management will be presented by the Philadelphia section and Temple University. The purpose of the symposium is the exchange of new and practical ideas and working methods and plans. In the short period of time that the section has sponsored this program, it has become one of the most popular professional events of the Delaware Valley industrial area.

The chairman of this year's symposium committee is George Nimick. Other committee members are: Robt. Holtzheimer, Charles Metzger, Arnold Cronshagen, W. Ralph Reeves, Wm. Maynard, Arnold Dodds, Jr., Dr. Russell Mark, and Andrew Graynor.

This year's program will be conducted by a group of speakers with wide and varied experience in the quality control field and promises to be one of the finest to date.

All members of ASQC in the Philadelphia area and all people interested in the many aspects of quality control should make it a point now to reserve Sept. 11 for attendance at the symposium.

Further information may be obtained from Dr. Russell Mark, Temple University, 1817 North Broad St., Philadelphia 22, Pa.

Quality to Meet the Demands of Space*

A Challenge to ASQC for Quality Control

DR. EDWARD R. SHARP

NASA Lewis Research Center, Cleveland, Ohio

A great tide of technological development has brought us to the new frontier of space exploration and travel. We face the exciting prospects of finding new knowledge about our universe and our place in it, and with the hope that the application of some of this knowledge will bring solutions of seemingly insoluble problems. I am pleased to talk on this subject because of the opportunity it gives me to present one of our most perplexing problems and to enlist your aid in its solution. I speak of our imperative need of, and our quest for reliability—complete reliability or the best possible approach to it.

The Russians jarred free-world complacency on October 4, 1957, by launching the first man-made satellite. Since then, the press has been full of space-age news, our minds have been full of space-age thoughts. Even our youngsters are using space-age words. The space age is here.

May I describe some of the challenges of the space age, its impact on our society, and the paramount role of quality control in the incredible complexity of space-age technology? Perhaps we can best approach the subject by answering four basic questions:

1. What is space?
2. Why are we interested in space?
3. What is our nation's space program?
4. What are the problems of accomplishing space exploration?

What Is Space?

A simple definition of "space" is the *universe beyond the atmosphere surrounding our own planet.* One scientist humorously put it this way, "Space is that in which everything else exists" or, in recognition of Russian exploits, "Space is the hole in which we currently find ourselves."

Astronomers have already mapped out vast reaches of space. Let us review a few of the things they have discovered.

The most important object in our part of the universe is the Sun, source of our heat, our light, and in the last analysis our food supply. In its neighborhood are nine planets which travel in orbits around the Sun and accompany the Sun in its motion through space. The Earth is number three, at just the right distance for our delicate bodies, so that we neither roast nor freeze, at a distance of 93-million miles. Our nearest neighbor is the Moon about 240,000 miles away on the average, moving in an orbit about the Earth and accompanying us on our yearly journey around the Sun. The nearest planet to us is Venus, 26-million miles away. The next, Mars, 49-million miles away. The farthest planet, Pluto, is 3680-million miles from the Sun.

To comprehend these tremendous distances, let us suppose that we now had spacecraft able to travel at 600 miles per minute, which is approximately the initial velocity required to escape from the solar system, or 60 times the speed of a jet transport. It would take us seven hours, 40 minutes to travel the average distance to the Moon; 24 days to Venus; 58 days to Mars; 108 days to the Sun; 11½ years to Pluto.

The nearest star is 25 million million miles away, and travel to it at 10-miles per second would require 80,000 years. It is evident, to me at least, that our exploration will be confined to the solar system for some time.

The greatest speed we experience is that of light, some 186,000 miles per second. We call the distance light travels in one year, a light year. It is nearly six million million miles. Thus, the nearest star is a little over four light years away. Our Sun is 26,000 light years from the center of our galaxy, the Milky Way. Such distances become almost beyond our comprehension. As we take our first steps in space exploration, we recognize that for many years to come we are limited to space as measured by our own small solar system.

Our Interest in Space

It is apparent that we could continue our existence after a fashion, without participating in space exploration. Now, the second question, "Why are we interested in space?" Let me try to answer.

Man wants to do new things. Some groups have been content to follow the rut in which they find themselves, and to shun things new. Such people have retired from the affairs of mankind. Peoples following this philosophy soon find themselves left behind—or worse. I am sure that the people of the United States will not accept a role ignoring new activities; we will not retire to the backwaters of world existence.

One of our reasons for interest in space then is *man's curiosity to explore, to discover, and to chart the unknown, and to assume leadership in the affairs of men.*

*Luncheon address presented at the 13th Annual ASQC Convention, Cleveland, Ohio, May 1959.

What do the practitioners of the various sciences seek?

The *geophysicist* has arrived at new conclusions as to the Earth's precise shape. Vanguard I shows the Earth to be pear-shaped. Of what importance is this knowledge? Ask the geophysicist, he urges research in all earth sciences.

The *meteorologist* will use satellites to study air mass movements and distribution for application to accurate, long-range weather forecasting. Vanguard II contributed importantly in this direction.

The *physicist* has learned of the magnetic and electric fields around the Earth. The Van Allen radiation belts were recently discovered through our satellites and space probes.

The *astronomer* has been handicapped in observations because of the atmosphere between his telescope and the stars. Now he will be able to get on top of this obscuring curtain to improve his observations by orders of magnitude.

And the *astrophysicist* will learn about cosmic rays and their origin, and will discover new rays and particles.

Many ask what good will all this do? There are some practical applications we can recognize even at this early stage in the business. For example, improved weather forecasting and storm warnings may benefit our economy to the tune of billions of dollars a year. This is much more than we are currently spending on our space program. Benefits are also expected in long-range communications through the use of radio-relay and television-reflector satellites.

Another reason for interest in space is *the contributions space activities can make to our national economy.* Scientific and engineering exploits have always led to man's betterment. At the start of the space age we do not know precisely what the benefits will be. We are today, with respect to astronautics, about where we stood with respect to aviation when the Wright Brothers flew their first airplane. They could not then imagine what aviation would grow to be, and what economic benefits would accrue. Likewise, we cannot now appreciate the beneficial impact of space on our economy. Another reason for our interest in space is *potential military uses for satellites.* These include satellites for surveillance, communication and navigation.

Let us speculate regarding lunar bases and space platforms from which bombs might be dropped onto Earth. And for sake of example, briefly consider the surveillance application.

A satellite launched into a proper orbit will periodically pass within visible range of every spot on Earth. If orbiting at a height of 200 miles, and provided with a 12-inch telescope, a resolution of some two or three feet at the surface would be possible. Think what this would mean to an enemy!

No secrets of an important military nature could be kept for long from an enemy possessing such a satellite. No argument is needed to show that we need the same or better, as a deterrent, or indeed a defense weapon.

Our Space Program

Let us now turn to the next question "what is our space program."

Our aim is the opening of space to mankind. Current phases of space work will pave the way for that achievement. Everything that we accomplish in the meantime, with sounding rockets, satellites, and space probes, brings us useful information. But real progress *will* be measured by the degree to which it contributes toward two basic objectives—greater knowledge of the universe, and the second objective—manned flight in space.

The National Aeronautics and Space Administration was established by The Space Act of 1958 as an independent government agency. NASA has responsibility under the President for space research and operations of a scientific and technological nature for peaceful purposes.

Starting on October 1, 1958, NASA absorbed the personnel and facilities of The National Advisory Committee for Aeronautics. This included some 8000 scientists, engineers and supporting personnel at research centers in Virginia, California and here in Cleveland, as well as other activities. In addition, the Vanguard project was transferred from the Navy, and more recently, the CalTech Jet Propulsion Laboratory was transferred to NASA from the Army.

NASA has about 9000 employees. A large part of its research and development activities will be carried out under agreements with other government agencies, scientific institutions and universities, and private industry.

Contracting with industry on a multi-million dollar scale requires the highest quality of American scientific and industrial skill, as well as the best capabilities of government laboratories. We must draw on these resources to develop and produce the tools needed to establish leadership in space.

Problems in Accomplishing Space Exploration

Quality control people are naturally concerned with the role they will be playing and the contributions they will be asked to make in the space program. The vital place of this profession perhaps will become apparent as we look at the problems facing us. The three principal problem areas in space research are:

1. Development of more thrust in booster rockets to lift bigger loads into space.

2. Development of the highest reliability in all the components of space vehicles, as well as in the control and tracking systems, and in the telemetry systems which return the results to us.

3. Development of more knowledge about man himself in the alien, unfamiliar environment of space.

A vigorous program to accomplish these objectives is well under way. For example, the department of defense is rapidly developing a cluster of eight Jupiter IRBM rocket engines to produce a total thrust of 1,200,000 pounds. This cluster will provide the booster stage for a vehicle named Saturn, capable of placing more than 30,000 pounds of payload in orbit.

Using existing engines, the Saturn booster will be available earlier than its successor, the 1½-million-pound-thrust, single-chamber engine, now under development for NASA by North American Aviation. These giants will ultimately be clustered to produce the 6-million-pound-thrust booster stage of the vehicle we call Nova.

Now under contract are new interim vehicles like the multi-staged rocket vehicle called Scout, recently ordered from Chance-Vought to perform routine, eco-

nomical launchings-into-orbit of scientific payloads up to 150 pounds. There will also be the Thor-Delta vehicle, capable of impacting the moon with a 100-pound payload.

Two other current developments will add high-energy-propellant upper stages to the Atlas ICBM to improve its usefulness as a space vehicle booster. The Air Force placed a modified Atlas in orbit last December with a 150-pound payload that gave this country its first orbiting relay communication satellite. With additional new stages, Vega and Centaur, now both on order by NASA, we will be able to soft-land 430 and 750 pound payloads, respectively, on the Moon, or to perform a host of other significant space missions.

Thus, in the next five years or so, we will have a family of chemical rocket-powered vehicles to take us closer to most of our foreseeable space goals, and the Atomic Energy Commission and NASA jointly are developing nuclear rockets for application to space missions. Also under active development are the new electric rockets powered by nuclear or solar energy for future planetary explorations.

Problem Areas

The vehicles I have just described have three problems in common:

1. they are unbelievably complex and we see no hope of simplifying their design;
2. they are very expensive; and,
3. they leave no margin for error in their proper functioning.

The early success of their assigned missions is vital to the prestige of our Nation, in fact to its ultimate security.

You can better appreciate our dire need for the ultimate you can give us in quality control practices if you will think for a moment about these space vehicles. A typical, large, multi-stage rocket, required to boost a small payload into space, will cost several millions and may contain as many as 300,000 parts. The parts are assembled in a host of vital components and interdependent subsystems, each designed to perform close to the limit of its capacity, all designed for the absolute minimum weight, and in the case of satellites, will be required to function properly for years.

So tightly interdependent are the parts of these vehicles, that the failure of a single tube, valve, pump, seal, coupling, tank, wire, switch, explosive bolt, battery, timer, transistor, gyro, computer, programmer, or any one of a host of other instruments or components, may cause the entire mission to be aborted and an essential step in a larger program irrevocably lost.

The tremendous rate of progress in space research, as one discovery piles on the next, causes an unprecedented rate of feed-back of new information into the design of the immediate next payload and launching vehicle. Nothing comparable to this has ever before occurred.

Reliability is a relative thing, and so, perhaps we may seek, but not expect to achieve absolute, 100 percent reliability. But for the vastly complicated space missions where great investments of money and prestige ride on a single shot, and especially where a man is aboard, we need the closest possible approach to absolute reliability.

We need reliability based on the best possible system concept, the best possible detailed design, the greatest possible integrity of materials and workmanship. In all these aspects, the advances your profession have already contributed and the further progress we seek will be vital to our success. We give you this challenge, and we will need every assistance you can give us.

Complicated as the space vehicle is, it is only a small part of an over-all system. There are, of course, the very extensive and complex launching and tracking ranges where operations start, and where the heartbreak of initial failures too often occur despite the greatest care that we know how to exercise. The Atlantic Missile Range based at Cape Canaveral, Florida, and the newer Pacific Missile Range based at Vandenberg Air Force Base, California, perform this function.

Success of the space mission after the initial launch depends on acquiring the trajectory of the payload, observing its position and attitude, receiving and recording the signals radioed from the payload, and processing the signals to provide intelligible data for scientific study.

The NASA's minitrack network installed mainly along the 75th meridian is a typical east-west satellite tracking system. The expanding of this and other networks into a well integrated world-wide system is currently in progress. New systems are contemplated for tracking polar satellites like the Discoverer II and III. Optical tracking stations of great precision have also been installed at strategic locations around the world. Large, mobile precision antennas in England, Puerto Rico, Hawaii, and the United States have been built to track probes like Pioneer IV far into space.

The difficult problem of specialized data reduction from the wealth of different space projects has resulted in the creation of data reduction centers where each job is best handled. Centers like the Naval Research Laboratory Vanguard Center in Washington, those at the Jet Propulsion Laboratory and Space Technology Laboratories in California, the Signal Corps Laboratory at Fort Monmouth, New Jersey, and the NASA's Lewis Research Center here in Cleveland, do this job in close coordination with the world-wide tracking facilities I mentioned.

Perhaps the most difficult of problem areas is understanding the capabilities of man himself in this adventure. Intensive effort is required to assure that space flight volunteers possess the physical and mental stamina needed for flight in space.

To focus and give meaning to these activities, we have undertaken Project Mercury, in which we will loft a man into space.

In this undertaking, we are proceeding with all of our energies. We are working toward the moment when man can travel in space at times, and to places of his own choosing. You will then want *absolute reliability.*

Thus, I have outlined certain problem areas.

Closure

In closing, let me draw some general conclusions about quality in the Space Age. First, in opening space to mankind the problem of reliability is of paramount importance. Second, to assure success of our space programs, we must provide positive assurance of the ultimate in quality control at every step of the program. Finally, we must develop a degree of perfection never before realized. We are working with devices and systems of hitherto unequalled complexity. The problems we encounter call for your best efforts—indeed, of a whole new order of magnitude.

We look to the Quality Control Profession to assure success in this Nation's space research.

A Note on

ANOVA in the Transistor Industry

H. C. HAMAKER

Philips' Research Laboratories, Eindhoven, Netherlands

Editorial Note

We believe a number of our readers will be interested in the accompanying note and portions of the correspondence it generated between the contributor and the authors of the subject article. Our sincere appreciation to Dr. Hamaker and to Messrs. Wortham and Anderson for their cooperation in jointly carrying these further illuminating comments to a point where they can be put before the *Industrial Quality Control* audience.

M. E. W.

In the March '58 issue of this journal an article by Anderson and Wortham* described an application of analysis of variance in the transistor industry which seems to me to invite some comments.

The influence of four types of transistors (A, B, C, D) on the signal output of a generator was investigated by means of a 5 × 5 Graeco-Latin square arrangement, the experiment being repeated with fresh groups of transistors in 11 different apparatus.

The lay-out and results for the first receiver were as shown in Table I.

Now the value of 150 in the right-hand top corner seems to be excessively high, compared to the other observations, and one might be inclined to suppose some disturbance or clerical error to have been operative. If, in keeping with the customary missing plot technique, we replace this observation by X and then carry through the analysis of variance we find that the residual sum of squares contains the terms in X

$$0.32X^2 - 55.2X \qquad (1)$$

and is minimized for

$$X = \frac{55.2}{2(0.32)} = 86 \qquad (2)$$

*Anderson, Roger W. and Wortham, Dr. A. W., "An Application of Variance Component Analysis in the Transistor Industry," *Industrial Quality Control*, Vol. XIV, No. 9, Mar. 1958, p. 11-15.

Carrying out the analysis of variance both with the original value 150 and with its missing plot substitute of 86 we obtain the data shown in Table II.

This demonstrates that one rather extreme observation has indeed a considerable influence; the mean square for the residual is reduced by a factor eight.

There is one more observation in the data of Wortham and Anderson which would seem to me suspect at first sight; that is the output of 3 KUV for receiver No. 5 for which all other observations vary between 18 and 37 KUV. The missing plot substitute for this observation would be 30 KUV and the corresponding changes in the sums of squares are fairly large, though not so excessive as in the case of receiver No. 1.

If we replace both these suspected observations by their missing plot substitutes and then carry out the full analysis of Wortham and Anderson we obtain the results recorded in Table III.

Even taken over the whole set of 11 × 25 = 275 observations these two observations have a fairly pronounced influence; the mean squares for the four types of transistors are all reduced by 30 percent or more and the residual goes down from 22 to 5.4, if we use the missing plot substitutes instead of the original figures.

The following argument seems to provide further evidence that the two observations indicated above do not fit the general pattern. There exist considerable differences in average output amongst the different receivers; the lowest output is 16.5 KUV for receiver No. 10, the highest 45.8 KUV for No. 1. It would be reasonable to expect that variances or mean squares will increase or decrease with the average output. This is borne out by Fig. 1 where we have plotted the residual standard deviations for each receiver against the average output. But we also see that receivers No. 1 and No. 5 show fairly pronounced deviations and fit the general pattern much better if we use the residual resulting from the missing plot analyses. The data used in Fig. 1 is recorded in Table IV.

TABLE I—Graeco-Latin Square

	Layout					Results (output in KUV)				
	A1	A2	A3	A4	A5	A1	A2	A3	A4	A5
B1	C1, D1	C3, D2	C5, D3	C2, D4	C4, D5	35	44	44	22	$\bar{x} - 86$
B2	C2, D2	C4, D3	C1, D4	C3, D5	C5, D1	32	67	31	52	46
B3	C3, D3	C5, D4	C2, D5	C4, D1	C1, D2	35	40	42	55	36
B4	C4, D4	C1, D5	C3, D1	C5, D2	C2, D3	59	62	39	51	28
B5	C5, D5	C2, D1	C4, D2	C1, D3	C3, D4	72	29	81	29	29

If we accept the missing plot substitutes and then adjust a straight line through the origin by least squares we find

$$s = 0.067\ \bar{X}$$

the line drawn in Fig. 1. Since the individual values of s are based on eight degrees of freedom* we can construct a set of 95 percent control limits, which are given by the dotted lines in Fig. 1. The standard deviations are not in control; receiver No. 10 in particular falls far outside the upper limit. This cannot, as a closer inspection of the data reveals, be ascribed to a single outlying observation.

Whether the analysis carried out in Fig. 1 is of much value in the present context may seem doubtful. But cases where the standard deviations can reasonably be expected to vary proportionally with the average level of the response do occasionally occur and we have met other cases where an analysis of the type of Fig. 1 was appropriate. Hence we thought it useful to present the analysis here.

Whether the two extreme observations for receivers No. 1 and No. 5 should really be considered as outliers

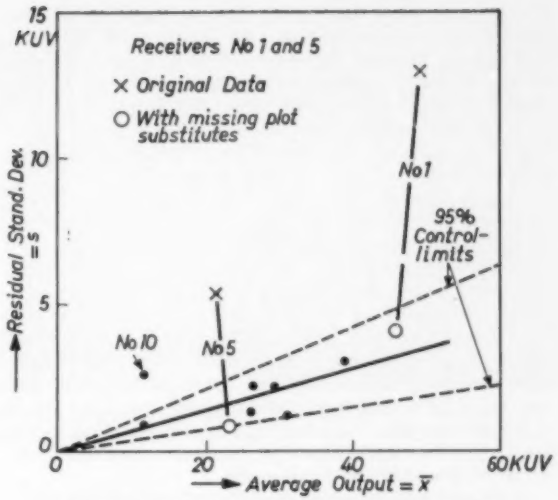


Figure 1—Residual Standard Deviation Plotted Against Average Output

TABLE II—Analysis of Variance for Receiver No. 1

Source	Original Data SS	DF	MS	With Missing Plot Substitute SS	DF	MS
Transistor A	681	4	209	133	4	33
B	835	4	170	133	4	33
C	8328	4	2082	4541	4	1135
D	5037	4	1259	2210	4	552
Residual	1339	8	167	130	7	19

TABLE III—Analysis of Variance

Source	Original Data SS	DF	MS	With Two Missing Plot Substitutes SS	DF	MS
Receivers	25019	10	2502	21582	10	2158
Transistor A	1736	44	39	1128	44	26
B	2002	44	46	1208	44	27
C	11511	44	262	7567	44	172
D	7321	44	166	4710	44	107
Residual	1903	88	22	465	86	5.4

or not we would not like to decide on the basis of the purely statistical arguments advanced above. Whether we use the original data or the missing plot values will not materially alter Wortham and Anderson's main conclusions, which referred to the *relative* importance of the different sources of variation and not to the absolute values of mean squares or variance components. On the other hand if out of a total of 275 observations, one or two have such a pronounced influence on the numerical results of the analysis of variance the fact should, in our opinion, not go unnoticed.

Finally it should be mentioned that we have not been able exactly to reproduce Anderson and Wortham's numerical results. For the between-receivers sum of squares for instance we obtained the value 24487 whereas they give 25019. Presumably some clerical errors have crept into the table with their original data. This is nothing remarkable; it is difficult to reproduce a table with 275 observations free of any error.

*Except those for receivers No. 5 and 10 which, owing to the missing plot adjustment have only seven degrees of freedom, but for the present purpose we can neglect this difference.

Comments by A. W. Wortham

Mr. Anderson and I have reviewed Dr. Hamaker's analysis of "ANOVA in the Transistor Industry." Although we found his analysis quite interesting, and at least in one case of value in locating a difficulty other readers may incur, we are not at all surprised at the results, nor can we find them of any real use to us.

The one difficulty that we did find is in the between-receivers sum-of-squares where his calculations did not agree with ours. Even though this difference is quite large, it is a result of rounding the original data to make it easier for presentation. To clarify this point, the sum of the table as given in the article differs from the true sum by 17.5 units. This difference will naturally have a large effect on the correction factor used in the total and between-receivers sum-of-squares. All other data presented in the publication is correct.

I believe Dr. Hamaker's comments on the effects of eliminating the one measurement of 150 are interesting. Not only was this noted at the time of the study, but even more detailed analyses were performed than in Dr.

TABLE IV—Average Output and Residual Standard Deviation for each of the 11 Receivers

Receiver	Original Data Average	Original Data Standard Deviation	With Missing Plots Average	With Missing Plots Standard Deviation
1	48.4	12.9	45.8	4.0
2	25.4	1.2		
3	29.0	2.1		
4	18.5	0.5		
5	21.9	5.4	23.0	0.9
6	30.6	1.1		
7	26.4	2.1		
8	16.9	0.9		
9	19.2	0.5		
10	16.5	2.6		
11	38.5	3.0		

Hamaker's note. In the first place the value of 150 was questioned and discussed at some length with the engineers, and was actually repeated as a valid measurement. It is not unusual in transistor problems to find values which differ radically from the group. In actual fact, the data on each receiver were analyzed separately, and in the case of this observation, analyses were made both with and without the observation.

As a final point, and one which disturbs us considerably, and by the way, one which would be very worthwhile as a publication, possibly by Dr. Hamaker, we would like to know in experimental design studies what criterion can be used for discarding data. In quality control studies, there are criteria which are not substantiated theoretically, but which are used in practice. In our particular case we would hesitate to discard any of the data considered correct by our engineering staff since we would have no basis for determining the influence of this action on the estimates; that is, we would no longer be sure of the unbiasedness or minimum variance properties of the variance components.

It should also be noted that Dr. Hamaker was actually more involved with the analysis of variance proof and tests of significance rather than the variance component portion, the illustration of which was the specific purpose of the subject paper.

Further Comments by H. C. Hamaker

I was pleased to learn from Dr. Wortham's comments that the apparent discrepancy of one observation for receiver No. 1 was duly noticed and investigated by the authors. Only this fact should have been mentioned in the original paper; my note would then have been superfluous.

But when the discrepant observation of 150 KUV for receiver No. 1 was discussed with the engineers, checked and found correct, this raises another problem. To explain this observation we have either to assume that the distribution of residual errors is highly abnormal, or that there exists some peculiar kind of interaction between transistors and/or receivers, which is not as a rule manifest but occasionally produces highly discrepant outputs.

My own inclination would be toward the second hypothesis. But Anderson and Wortham explicitly state that "effects on output of the various transistors are additive and do not interact." Can this be upheld in face of the results of the experiment?

Anyhow if the outlying output of 150 KUV is reproducible it may form the subject of a further specific inquiry. If it is due to some kind of interaction, is this an interaction between transistors, or between transistors and receivers? Had we used the same transistors and transistor combinations of receiver No. 1 with other receivers, would we again have found discrepant outputs or not? By pursuing this point we may hope to gain new insight into the properties of the particular transistors and circuit and the way they combine into a generator; and an improved understanding of this basic mechanism is often of greater value than the result of an elaborate statistical analysis.

The point I wish to make is, that if we observe an apparently discrepant result which is reproducible and thus not due to some kind of abnormal error, it may be the task of the statistician to point out that the conditions which have led to this abnormal observation might be made the subject of further investigation.

I understand from Dr. Wortham's comments that the original observations reproduced in their Table II are rounded data, but that the analysis of variance recorded in Table V was performed on the observations before they were rounded. This raises a problem of policy in publication. My own opinion is that if an article contains the original data together with the results of an analysis of variance these should be made to correspond, so that, if anyone should take the trouble to check the computations, he should arrive at the same results. I always feel unhappy if I find such discrepancies as those to which I drew attention. If therefore the original data are rounded to simplify publication, and because the additional decimals are not worth retaining, the analysis of variance published should preferably be valid for the rounded data. In a case like that in Anderson and Wortham's article it would have been desirable to add a note to Table V to the effect that this analysis does refer to the data of Table II before they were rounded.

Also, if we round the original data should not we also round the sum of squares and mean squares in the analysis of variance. The sum of squares for receivers has changed from 25019 to 24487 due to rounding; to record this sum of squares as 25019.13 makes little sense. In my opinion far too many decimals are usually retained in analysis of variance tables.

As to Dr. Wortham's final question; when are we justified in rejecting observations, I have no final answer. I think too much has been written about *rejecting* an outlying observation. In a case like that of receiver No. 1, I would prefer to carry out the analysis both with the outlier and with its missing plot substitute. In several such cases I have found that the technical conclusions to be drawn from an experiment are not really altered, and in such circumstances we are not in serious trouble. Anderson and Wortham's data furnish another example where this holds true.

Should, however, the conclusions be materially different in both cases, then it should be clearly stated that the conclusion to be drawn from the experiment depends on whether or not we consider a suspected observation as correct or erroneous.

It may indicate that the model we have assumed in designing and analysing the experiment is wrong.

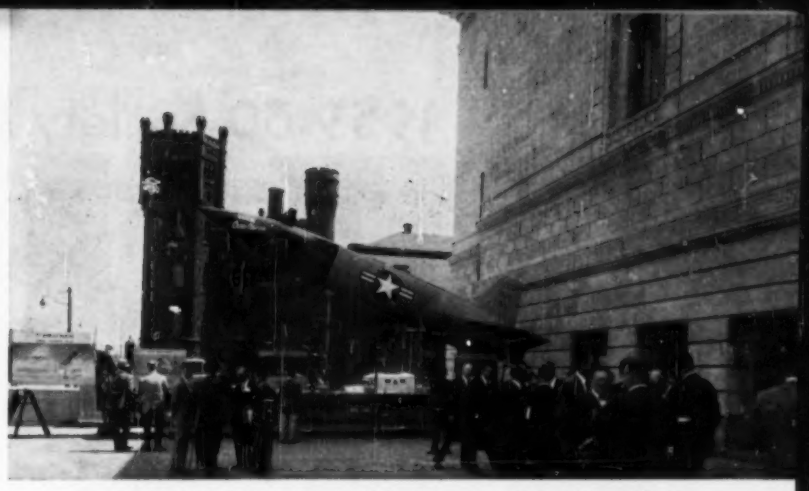
Dr. Wortham "would hesitate to discard any of the data considered correct by the engineering staff since we would have no basis for determining the influence of this action on the estimates; that is we would no longer be sure of the unbiasedness or minimum variance properties of the variance components."

Of course when an apparently outlying observation has been repeated and found to be correct it must be accepted as valid. But we are then not much better off as far as the analysis of variance is concerned, because this one observation clearly indicates that the model we have assumed in designing and analyzing the experiment may be wrong, and the use of a wrong model equally introduces biases in the analysis of variance.

Closure by Dr. A. W. Wortham

I have reviewed Dr. Hamaker's comments on our article and am in substantial agreement on all of the points he has set forth. I believe there could be considerably more correspondence on numerous points which are perhaps academic in nature and others which are beyond the scope of his notes since they would undoubtedly lead into the further stages of the particular program the article was concerned with. At this time, we agree that the publication of these comments would serve as a contribution in more ways than one. Since the points brought forth in the last commentary do not really require rebuttal, this is perhaps an opportune time to close the correspondence. Otherwise the true purpose of the original article may be lost to the reader.

Report of the Thirteenth Annual Convention



SPACE AGE—The Air Force exhibits drew many visitors. Those who attended the convention will remember the "Rascal" which was displayed outside the auditorium.

Cleveland, Ohio, May 25, 26, 27

CONVENTION ACTIVITIES really started on Thursday, May 21, when Paul Clifford held a workshop seminar on Management of Quality Control at the Hotel Sheraton-Cleveland. This seminar was well attended by 69 registrants and lasted for three days. Many of the registrants stayed over for the Convention.

Open House

On Sunday, May 24, The Cleveland section played host at an open house at the Whitehall Room of the Hotel Sheraton-Cleveland. Members of the Cleveland section were assisted by their wives in greeting the out-of-town visitors.

Program

On Monday morning the program started at the Cleveland Public Auditorium. The technical sessions were staggered in order to provide adequate time for the participants to visit the exhibits. The various fields represented were education and training, chemical, metals technology, administrative applications, general interest and the armed services. An innovation was the "Shirt Sleeves Clinic" which covered mechanical measurements, optical gages and nondestructive testing from the strictly practical viewpoint.

Registration

This year showed a gain in registrations, topping the previous year's registrations with 1545 registrants.

Facilities

Many business and committee meetings were held in the Hotel Sheraton-Cleveland. The social evening, the open house and the banquet were held in the Ball Room. The sessions were all scheduled in the Cleveland Public Auditorium along with the exhibits. The annual meeting was also held [illegible] auditorium.

Luncheons

On Monday Wade Weaver, Chairman of the Cleveland Host Committee and of the General Convention Committee, introduced the Executive Secretary of the Cleveland Chamber of Commerce, Mr. Curtis Lee Smith, who read the Proclamation of Mayor Anthony J. Celebrezze, Mayor of the City of Cleveland, proclaiming the Week of May 25th as *Quality Control Week* in Cleveland. A proclamation was also issued by Governor Michael V. Disalle, Governor of the State of Ohio, proclaiming this week as *Quality Control Week* in the State of Ohio. The

(Continued on page 18)

The Leaders of Your Society for 1959-60

Group pictures are always difficult during a convention but most of the higher echelon of your society were "caught" here. (Front row, left to right) A. V. Feigenbaum, L. S. Eichelberger, C. E. Fisher, Ellis R. Ott, J. Y. McClure. (Back row, left to right) Leon Bass, H. Davis Birch, Mason E. Wescott, Gerald J. Lieberman, A. W. Wortham, Allan M. Hull, David S. Chambers. Ailin P. Deacon and Warren R. Purcell "escaped".

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and Development
Radio Corp. of America
Camden, N. J.

Harry G. Romig
Director, Quality Control
Paper-Mate Mfg. Co.
Culver City, Calif.

Irvin W. Schoeninger
Ass't. Ch. Ceramic Engr.
Centralab Division
Globe-Union, Inc.
Milwaukee, Wis.

Stanley B. Sherwood
Supervisor, QC Committees
General Motors Tech. Center
Detroit, Mich.

James T. Skelton
Supt. of Inspection
Caterpillar Tractor Co.
York, Pa.

Frank H. Squires
Mgr. of Reliability & QC
Topp Industries, Inc.
Los Angeles, Calif.

Andrew P. Stergion
Manager, Quality Control
Corning Glass Works
Corning, N. Y.

Robert I. Tenney
Technical Director
The Fleischmann Malting Co.
Chicago, Ill.

Thomas E. Turner
Chief Inspector
Diamond Chain Co., Inc.
Indianapolis, Ind.

SHEWHART MEDALIST—Dr. Irving W. Burr of Purdue University was selected as this year's Medalist. Dr. Burr is shown during his acceptance speech which appears in its full context on page 7 of this issue.

(Continued from page 15)

luncheon speaker was Fr. Frank Birkenhauer, S. J., who gave an illustrated talk on his trip to the Antarctic. This was part of the National Geo-physical Year Program. Fr. Birkenhauer is a Seismologist.

In keeping with the Missile Age, the luncheon speaker on Tuesday was Dr. Edward R. Sharp, Director of the Lewis Research Laboratory, NASA, Cleveland, Ohio. Dr. Sharp revealed some of the developments in the company's missile program and described some of the work that is being done at the Research Laboratory. (*Edit. Note*: Dr. Sharp's address appears on page 9 of this issue.)

On Wednesday the Guest Speaker was Brig. Gen. Joseph M. Colby, Deputy Commanding General, U. S. Army Ordnance Missile Command, Redstone Arsenal, Ala. Gen. Colby illustrated his talk with color movies of the armed missile program. This film showed the actual firing of the wide-range of operational missiles which the Army has in the field. Gen. Colby emphasized the importance of reliability in the modern planning and production for the Armed Forces requirements.

Social Evening

At 9 o'clock on Monday evening the Convention registrants enjoyed a stimulating social evening which was widely attended. A carnival atmosphere was created by the games of skill (?) which were set up and operated by Ray Marks of the Cleveland section and his able crew. Prizes ranged from canes to stuffed animals for the lucky contestants. Door prizes were contributed by: Aluminum Company of America; Excello Corp.; General Electric Co.; Ohio Bell Telephone Co.; Pratt & Whitney Co.; The World Publishing Co.; H. G. Collins Gage Co.; Freeland Gage Co.; The Lamson & Sessions Co.; Zero Gage Co.; Sheffield Corp.; and Tinnerman Products, Inc.

Exhibits

The exhibits were set up in the Cleveland Public Auditorium. The Armed services were heavily represented this year. The Book Booth, under the direction of Fred Leone and under the management of Barney Fields of Fields' Book Store, did a thriving business. The following is a list of exhibitors.

1959 Convention Exhibitor's List

American Cystoscope Makers, Inc.
Pelham Manor, N. Y.

American Telephone and Telegraph Co.

M. E. Cunningham Co.
Pittsburgh, Pa.

Custom Scientific Instruments, Inc.
Arlington, N. J.

Dow Mechanical

Elliott Service Co., Inc.
Mount Vernon, N. Y.

International Business Machines, Inc.
New York, N. Y.

Lufkin Rule Co.
Saginaw, Mich.

Monroe Calculating Machine Co., Inc.
Orange, N. J.

Ohio Bell Telephone Co.

Ordnance Gage Laboratory

Republic Steel Corp.
Cleveland, Ohio

The L. S. Starrett Co.
Athol, Mass.

C. H. Storrs and Associates

Texas Electronic Products Corp.
Dallas, Texas

U. S. Air Force

U. S. Army

U. S. Navy

Veeder-Root, Inc.
Hartford, Conn.

Webber Gage Co.
Cleveland, Ohio

BRUMBAUGH AWARD—The winner of this year's award was Dr. Joseph M. Juran whose article "Cultural Patterns and Quality Control" appeared in the October 1957 issue. Warren R. Purcell (right) accepts the award from President Fisher on behalf of Dr. Juran.

The Annual Banquet

Opening the award program, President C. E. Fisher announced that the Board of Directors this year had established a special *President's Service Award* in recognition of the long hours of time and effort given to Society affairs while in office. Future awards will be made to each president upon his retirement from office; this year President Fisher presented each of the attending past presidents with his citation. Present to receive the awards were Ralph E. Wareham, Wade R. Weaver, Simon Collier, Alfred L. Davis, Paul A. Robert, Arthur Bender, Jr. and Dale L. Lobsinger. The award to George D. Edwards, the Society's first president, was accepted by Ralph E. Wareham; the posthumous award to Raymond S. Saddoris will be made to Mrs. Saddoris later.

The competition for the Saddoris Award for Section Management was a lively one again. Mr. Fisher announced that the winner was the Montreal section with a score of 12,261 points. Runnerup with 12,118 points was the Boston section and third place went to the Dallas-Fort Worth section with 11,771 points. Master sections, having a score of 75 percent or greater of the winning section, were Greater Detroit, Allentown-Bethlehem, Cincinnati, Lima, Metropolitan, Tucson, Greater Muskegon, and Mid-Hudson.

At this point President Fisher momentarily relinquished the chair to Prof. Mason E. Wescott of Rutgers • the State University who made the following introductory remarks in introducing Dr. Irving W. Burr, the winner of the Shewhart Medal:

Sponsor's Remarks on the Award of the Shewhart Medal to Professor Irving W. Burr

It is my happy privilege and high honor to appear before you as sponsor for the 1958 Shewhart Medalist. We honor in this manner on this occasion a man who has earned the respect and affection of all of us, Dr. Irving W. Burr.

Irving W. Burr's services to the science of statistics, to the field of quality control, to academic advancement, to industrial application, to ASQC professionally, and to countless hosts of individuals personally deserve, not only the distinction conferred by the award for which he has been named, but also the affectionate acclaim of his many friends and associates both within and without ASQC.

Let me read to you the official citation:

The 1958 Shewhart Medal is awarded to Dr. Irving W. Burr in recognition of his many contributions to statistical quality control as a pioneer in the teaching of statistical principles to men in industry; as a scientist who has interested students and colleagues in the study of statistics; as a contributor of articles to various journals; as an author of a textbook widely used in educational institutions; as a member of the Educational Board and the Standards Committee; as an officer, lecturer, and advisor to individual sections; and as a participant in Regional Conferences and National Conventions of the American Society for Quality Control.

SADDORIS AWARD FOR SECTION MANAGEMENT—This year's award went to the Montreal section. C. I. Taylor was section chairman during Montreal's victorious year and accepted the award on behalf of the section. The above photo shows those members of the Montreal section who were on hand at the Convention to share in their section's hard won recognition. They are: (seated, left to right) F. Clow, D. W. Guthrie, C. I. Taylor, Miss I. Loutit, S. L. Humphries; (standing, left to right) J. B. Pringle, W. T. Wingfield, J. D. Ledoux, A. F. Schmidt, R. G. Belcher.

It is appropriate here to expand with some specifics the implications of this citation.

Dr. Burr was born in Fallon, Nevada, received his B.S. degree from Antioch College in 1930, his M.S. from the University of Chicago in 1935, and his Ph.D. from the University of Michigan in 1941, majoring in mathematics and completing his Doctoral thesis in mathematical statistics. While at Antioch College, which operates on a cooperative basis with industry, he served as testman with Robbins and Myers in Springfield, Ohio, 1926-27 and with the General Electric Company in Schenectady, N. Y., 1927-30. In 1930 he entered the department of mathematics at Antioch College as an instructor, leaving there in 1941 as an Associate Professor and Chairman of the Department, to join the Department of Mathematics at Purdue University where he is now Professor of Mathematics and Research Associate in the Statistical Laboratory.

In 1952 he wrote the *Manual on Sampling Inspection by Military Standard 105A* for the National Screw Machine Products Association. This was the forerunner of several similar manuals on SQC published jointly by NSMP and ASQC.

In 1953, McGraw-Hill published his *Engineering Statistics and Quality Control*, a textbook of outstanding merit and recognition in the field of quality control engineering.

Since 1942, he has written and published over 30 papers on statistical and quality control subjects in such journals as our own *Industrial Quality Control*, *Annals of Mathematical Statistics*, *Journal of the American Statistical Association*, *Journal of Engineering Education*, *Journal of Educational Psychology*, *Psychometriks*, and others.

He was an early winner of this Society's Brumbaugh Award for his paper

(Continued on page 22)

Statistical Methods Course Sponsored by North Carolina State College

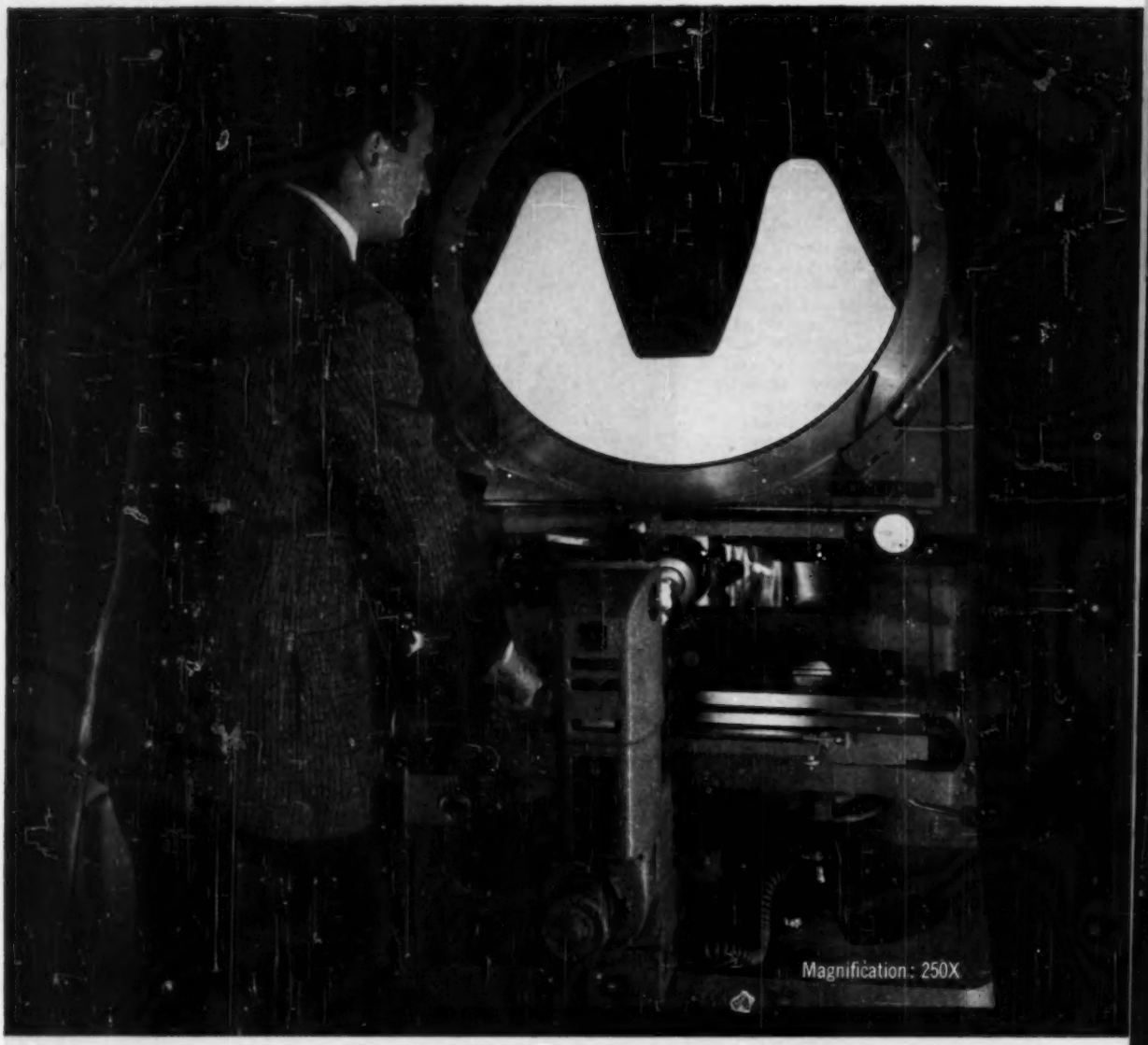
A special short course on statistical methods will be offered for research workers in industry and the physical sciences Aug. 10-15, at Brevard College in Brevard, N. C. Both introductory and advanced sections will be conducted by the North Carolina State College institute of statistics and the College extension division.

Registration will be limited to 50 students for each section.

The mountain resort location offers a variety of recreational facilities and the famous Brevard music festival will be held during this time.

Five members of the College's institute of statistics will conduct the course. They are: Dr. R. L. Anderson, statistical theory and experimental design; Dr. R. J. Monroe, advanced statistical analysis; Dr. H. L. Lucas, multiple regression analysis; Dr. R. J. Hader; and Prof. Victor Chew.

For further information or registration, contact the College Extension Division, Box 5125, State College Station, Raleigh, N. C.



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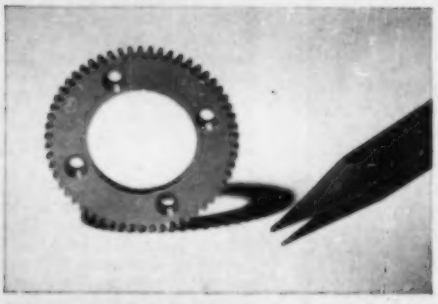

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◀ Note the actual size of this gear, which is enlarged for inspection on the FC-30 Comparator screen. Gear has 57 teeth, and has 1.1159″ dia. base circle.

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This new J & L light source unit gives *more than 5 times the intensity of the best filament light source available today.*

The light produced by the J & L Mercury Arc Lamp is actually a *new* kind of light . . . **you get a *steady* arc, with *no* flickering.** Its high intensity produces an incomparably bright screen with razor-sharp black shadow even at highest magnifications. Thus, accuracy of inspection and measuring is increased enormously. Now, you can literally "split tenths" with your J & L Comparator! (For use at low magnifications, the Mercury Arc light can be filtered readily.)

The J & L Mercury Arc Lamp comes as a complete packaged unit that is quickly interchangeable with the standard light source on any J & L 14-inch and 30-inch Comparator. This compact unit is a universal device to take various standard makes of mercury arc lamps.

For detailed information and specifications, or a demonstration, get in touch with your local Jones & Lamson representative, or write direct to Jones & Lamson Machine Company, Springfield, Vermont.

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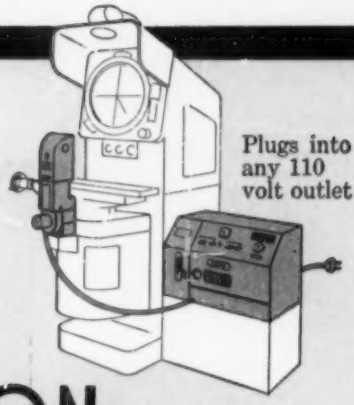

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PAST PRESIDENT'S SERVICE AWARD—In recognition of the time and work spent in Society activities while president, the Society's Board of Directors presented a testimonial plaque to each of the past presidents. Ralph E. Wareham (right) accepts the plaque on behalf of George D. Edwards, the first president of the Society. Immediately following the acceptance, Mr. Wareham received a plaque in his own right as second president of the Society.

(Continued from page 19)

in *Industrial Quality Control* on "A New Method for Approving a Machine or Process Setting."

He was a member of the first Editorial Board for *Industrial Quality Control* when ASQC was founded and has accepted appointment for a second five-year term on this Board beginning July 1, 1959.

He served the Society as Acting Editorial Chairman of this Board in 1952-53 during a leave of absence which the then incumbent Chairman—your present speaker—took for a trip to India in the interests of SQC.

His talents as a teacher have been used in over 60 courses in statistics and quality control for industrial personnel at various educational institutions and on numerous in-plant training courses.

In 1947 he organized and wrote the manual for the now famous Purdue Advanced Short Course in SQC which has since been given annually to about 50 registrants per course. Originally 8 days in length, the current course has been extended to 10 days duration and the manual revised and expanded to better serve the needs of the quality control field. Unique in concept and timeliness, this course has made a truly significant contribution to quality control in broadening the base of industrial applications of statistical methods.

As an effective and interesting interpreter of a technical topic, he has generously served the cause of statistical quality control in the capacity of speaker on Section, Regional, and National programs of both ASQC and other professional societies. He has twice been the chairman responsible for Midwest Conference programs.

Internally, he has served our Society as a member of its Standards Committee, of its Financial Advisory Committee, and more recently as a member of the Management Committee appointed to help put on a sound operating basis the new journal, *Technometrics*, companion to our *Industrial Quality Control* journal, and sponsored jointly by ASQC and the American Statistical Association.

Since it was first organized, he has faithfully served the Indianapolis section of ASQC as its advisor and just this month was given the Adair Award by this section. This award is maintained by the Indianapolis section in honor of Claude Adair, who was killed in an airplane crash during his term as chairman of the section. It is not awarded annually, but only as the section deems justified in naming an awardee.

Irv is a Founding Member and Fellow of ASQC, a Fellow of the American Statistical Association, a Fellow of the Indiana Academy of Science, holds membership in the Society of Sigma Xi, the Institute of Mathematical Statistics, the American Mathematical Society, the Mathematics Association of America, the Biometrics Society—and is a Bird Watcher of no mean repute!

As a member of the Purdue faculty, he has organized and taught in the curriculum of that university both undergraduate and graduate courses in mathematical statistics and statistical quality control, and has supervised the work of many candidates for both the Masters and the Doctoral Degrees in statistics.

These are the highlights of the tangible accomplishments one would *expect* to see associated with a Shewhart Medalist. But the Shewhart Medal bespeaks a deeper significance than can be found in merely counting up accomplishments, important as these are, for the winner of this award must first of all be a man whose character as a *person* does it an honor by accepting the recognition it bestows. It is to this aspect of this occasion I wish now to speak briefly.

My first acquaintance with Irving Burr took place in Pittsburgh in the summer of 1945 when he and I were associated with the work of the OPRD quality control program then centered at Carnegie Institute of Technology under the joint direction of Holbrook Working and Edwin G. Olds. It did not take me long to discover those traits of character in Irv which give a man a sense of real pride to be regarded as a close friend of his—and time has only served to confirm those first early impressions. He has an innate capacity for imparting and sharing that real quality of genuine friendship that transcends mere professional camaraderie.

Coupled with his keen insight, one finds humility rather than arrogance. Coupled with his breadth of knowledge, one finds openmindedness rather than superciliousness. Coupled with his intellectual and moral integrity, one finds understanding and generosity rather than intolerance. Coupled with his facile skill to grasp the essentials of a situation, one finds a heartwarming sense of good will and good humor rather than a disposition to seek personal aggrandizement. Coupled with his amazing energy and his active imagination, one finds, instead of a dominating aggressiveness, a generous willingness to lend a ready and a helping hand to those of us who need the inspiration and the guidance of his kind of friendship.

These are the attributes of greatness in a man, these are the attributes which

ASQC BOOTH—Information about the Society and its activities was readily available to those visitors at the convention who were being introduced to the quality control field.

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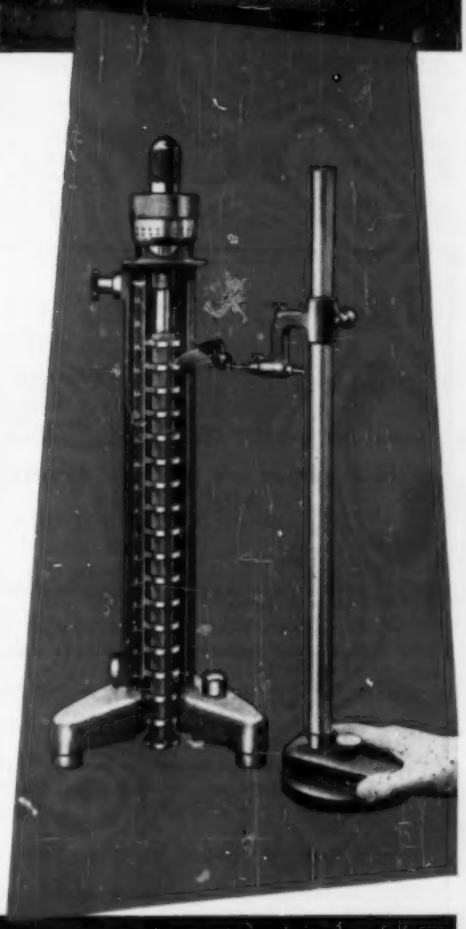

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all of us who have had the privilege of knowing Irv recognize in him, these are the attributes which move us to welcome this opportunity to do him honor on this occasion.

Mr. President and fellow members of ASQC, it is with deep personal gratification and affection I give you the 1958 Shewhart Medalist–DR. IRVING W. BURR.

Dr. Burr delivered an address which was equal to the occasion as well as indicative of the caliber of a Shewhart Medalist. The full text of Dr. Burr's address is presented on pages 7-8.

President Fisher then presented the Brumbaugh Award for the most outstanding paper published in Volume XIV (July 1957-June 1958) of *Industrial Quality Control*. This year's recipient was Dr. Joseph M. Juran, Consulting Management Engineer, New York City.

This award is made annually to the author of the paper published by the Society Journal, *Industrial Quality Control*, which, in the opinion of the judges, has made the greatest contribution to the science or practice of statistical quality control. It is named for the founder and first editor of *Industrial Quality Control*, Dr. Martin A. Brumbaugh, Director of Statistical Analysis, Bristol Laboratories, Inc., Syracuse, N. Y.

Dr. Juran was one of the founding members of ASQC and is a Fellow of the Society. He is a member of the Publication's Committee and was presented the Brumbaugh Award for his article "Cultural Patterns and Quality Control" which appeared in the October issue. The award was accepted for Dr. Juran by Warren Purcell.

Ladies Program

The Ladies' program was handled very effectively by Sam Troxel and his Ladies' Committee. The ladies heard a talk on "Gems" by Mr. Beattie on Monday. At lunch, there was a style show, presented by The Higbee Company. Plant tours for the ladies included a tour of Stouffer's Frozen Food Plant, Hough Bakery Catering Plant, a trip through American Greetings Corporation and a tour of The World Publishing Company.

The artistic side of the program was covered by a visit to the Cleveland Museum of Art where the May Show, an exhibit of local creative effort, was on display.

On Tuesday, Mrs. Nora Hollett of the Bell Telephone Company, presented a talk on "Color in Your Life."

section briefs

ALBUQUERQUE . . . The annual dinner meeting was held May 11 at the Sandia Base Officer's Club with 123 members and guests enjoying a wonderful steak dinner.

Retiring chairman A. L. Thornton introduced the new officers. They are: chairman—W. E. Boyes, Sandia Corp.; vice chairman—J. C. Gaskins, ACF Industries, Inc.; secretary—L. E. Snodgrass, Sandia Corp.; treasurer—O. D. Belden, Sandia Corp.; district representative—J. M. Weisen, Sandia Corp.

Gilberto Espinoza, prominent Albuquerque attorney and authoritative New Mexican and Southwest historian, gave an interesting talk on "New Mexico history."

ALLENTOWN-BETHLEHEM . . . The final meeting of the year was held at the Hotel Traylor on May 13. William Masser was the scheduled speaker; however, he was unable to attend. We were fortunate to obtain Wyatt Lewis of General Electric who gave a talk on "Programming the QC engineering job." Mr. Lewis spoke briefly about the aims of QC with regards to customer satisfaction. With the aid of slides, he vividly presented the QC activities during the manufacturing cycle. The various quality costs were discussed and methods of showing these costs by time and product groups were pointed out. A lively question and answer session followed Mr. Lewis' interesting and informative talk.

BALTIMORE . . . At our annual dinner meeting on May 19 a fine dinner at Wilson's Restaurant was enjoyed by 46 members and guests. Jack D. Englar, McCormick and Company, addressed the group on "Management aspects of quality control." He emphasized the need for instilling quality mindedness in the people who make the products.

Announced at this meeting were the new officers for 1959-60: F. J. Cullen, chairman; R. G. Hutter, vice chairman; D. H. Taylor, secretary; J. W. Kulp, treasurer. In addition the following were elected executive committee members: H. J. Ellner, S. L. Goldheim, and W. H. Miller.

Congratulations are in order to the past executive committeemen for a job well done during the past year.

BOSTON . . . Members and guests were conducted on a tour of the Hersey Mfg. Company's new Bronze Foundry on May 14. George Mason of the section and the plant host guided and described the foundry operations from start to finish. The tour was followed by a dinner.

Technometrics

the journal of statistics for the physical, chemical and engineering sciences

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co-sponsored and published quarterly by ASQC and ASA

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The Analysis of Life Test Data, *R. L. Plackett*

Mathematical Probability in the Natural Sciences, *R. A. Fisher*

A Quick Compact Two-Sample Test to Duckworth's Specifications, *J. W. Tukey*

Some Statistical Aspects of Economics of Analytical Testing, *O. L. Davies*

Partial Duplication of Factorial Experiments, *O. Dykstra*

Condensed Calculations for Evolutionary Operation Programs, *G. E. P. Box and J. S. Hunter*

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WHY NOT SEND YOURS IN TODAY?

SECTION CALENDAR

Dallas-Fort Worth
Aug. 22; Godfrey Ranch, Grapevine; 9 am-4:30 pm; annual outing

Hartford
Aug. 4; Nutmegger House; 5:30 pm; executive committee

Kansas City, Mo.
Aug. 20; Blue Hills Steak House; 6 pm; executive committee

The annual outing was held May 16 at the Cherry Hills Farm in Beverly, Mass. Highlights were a fine barbecue, a soft ball game between the section and the Merrimac Valley subsection. Children were presented with favors. As an added attraction a tour of a modern dairy layout was provided for all in attendance.

CINCINATTI . . . George T. McCollough Jr., Wyondotte Chemical Corp., gave a fine talk on process control at the May meeting. After the dinner Art Bucks presented a target shooting demonstration. Certificates were presented to the elementary and intermediate QC course graduates by instructors Merv Bratt, Dick Race and Don Flishel.

COLUMBUS . . . A large turnout of members and guests heard Louis J. Polk, Jr., Sheffield Corp., speak on the increasing demand for closer measurements in industry and the International Standard of Measurements at the management dinner meeting May 13. A lively question and answer period followed.

DALLAS-FORT WORTH . . . A delegation of nine made a good-will visit to the Waco section at the regular monthly meeting May 11. Included in this delegation were the vice-chairman, treasurer, secretary and program chairman. A good chicken dinner was followed by an equally enjoyable meeting. The program chairman of the two sections discussed the merits of changing the sectional meetings to the fourth week of the month.

James R. Gilman of Bay State Abrasive Products Co. gave a very interesting talk on "The Bay State Quality Assurance Program" at the regular monthly meeting May 14.

ERIE . . . T. P. Howley, General Electric Co., was the feature speaker at the Apr. 8 meeting which was attended by 38 members and guests. Mr. Howley spoke on the concepts of total QC with particular emphasis on process control engineering. The training session for the evening was presented by Mr. Herrick and Mr. Young of Erie Resistor. Their subject was "Normal distribution and calculation of estimates of scrap or rework."

EVANSVILLE-OWENSBORO . . . A very enjoyable evening was had by members, guests and wives at the annual ladies night program at Gabe's Restaurant in Owensboro May 9. A wonderful steak dinner was followed by entertainment by members of the section, introduction of new and old officers and committee chairmen, and brief speeches by the new officers.

Messrs. Schwartz and Marrs of Mead Johnson and Co. attended the annual convention in Cleveland.

GEORGIA . . . The spring meeting was held May 29, at the Georgia Institute of Technology. E. G. Field demonstrated the uses of Japanese Icosahedron Dice for generating random numbers and Dr. J. J. Moder Jr., commented upon the good results from testing these dice.

W. S. Smith of the Research Department of West Point Mfg. Co presented an illustrated talk on "Analysis of stock size variation."

Plans were outlined for the 1959-60 program.

GREATER DETROIT . . . The second annual joint government-industry meeting was held on May 2 at the Detroit Tank Arsenal.

The theme of this all day meeting was "tools for evaluating QC problems."

This theme was developed in talks covering: military specifications; definitions of minimum QC requirements; evaluation of contractor quality specifications and contracts; and new developments in the government's expanding use of SQC techniques and procedures.

Movies, lunch, a tour of the arsenal laboratories, and exhibits of new equipment and training devices augmented the speeches and made this meeting one that we hope will be continued for many years to come.

Meeting chairman Rene Samit, Detroit controls division of American Standard, is to be congratulated for a job well done.

GREATER MUSKEGON . . . A joint meeting with the Muskegon Manufacturers Association concluded the year's program on May 20. Four groups attending the annual affair were personnel, production control, safety, and QC. At the dinner meeting at Bill Stern's Steak House, the Rev. Carl Martenson, minister of the First Congregational Church of Port Huron, presented a highly entertaining and educational talk titled, "An address found in a purse." Through anecdotes, humorous and human, Dr. Martenson outlined the principles and patterns of behavior which all management people would find helpful in gaining the co-operation and respect of their fellow associates. In closing, Dr. Martenson pointed out that it is well to "practice the gentle art of finding something good in everyone."

At a recent committee meeting, it was agreed to hold an outing to keep the group together during the summer months.

HAMILTON . . . Members toured the Nuclear Reactor Building at McMaster University on May 7. The section is most grateful to the officials of McMaster and the very excellent guides who were generous in answering questions.

The following officers were elected for the 1959-60 season: G. Homewood, chairman; N. McCarthy, vice chairman; F. Vallely, secretary; and D. Kennedy, treasurer.

At a meeting of the new executives on May 21 the various committees were organized and a tentative program for the new season was drawn up.

HAMILTON-MIDDLETON . . . A vu-graph presentation of QC of rolling of foil was made by O. H. Bishop, Reynold's Metal Co., at a meeting May 13. The talk included consumer studies and complaints, critical defects in foil, statistical control of foil, equipment used in testing foil and checking foil in process. This talk was of interest in all phases of quality control.

Stan G. McIntosh, Champion Paper and Fibre Co., is now publicity chairman and reporter.

HARRISBURG . . . The final curtain fell on the section's 1958-59 year at the annual picnic held at the Stone Barn near Millersville, Pa. The chicken bar-BQ proved to be a fitting finale to the outstanding get-togethers which the arrangements and program committees have so ably presented during the year.

Officers and committees for the 1959-60 year were introduced and Jim Ramsey took over the reins as chairman. "Industrial Quality Control" files were presented to 11 members who had perfect attendance and this group, the "faithful eleven" shared in the drawing for additional prizes. Everyone present were eligible for the door prize drawing. The prizes were contributed by local industries which included Lambert-Hudnut, Hamilton Watch, Caterpillar, Schick, AMP, RCA, American Chain and Cable, and ALCOA.

HARTFORD . . . At the first executive committee dinner meeting of the 1959-60 officers, the following committee chairmen were appointed: education chairman—Eugene Ellis, Pratt and Whitney; membership chairman—Arran Nergararian, Hueblein, Inc.; publicity chairman—Charles Dennis, Royal McBee Corp.

Dorian Shainin, Rath and Strong, Inc., addressed a capacity crowd at the last meeting of the season. Mr. Shainin spoke

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on a favorite subject to all, "100 percent inspection—it's strength, weaknesses and what to do about it," as was indicated by the questions which followed his speech.

KANSAS CITY . . . The annual spring family picnic was held May 23 and a good time was had by all.

Those of us who were unable to attend the annual convention are looking forward to a report on the convention to be given at the next meeting.

LOS ANGELES . . . New officers for 1959-60 are: chairman—Henry Matosoff, Cannon Electric Co.; vice chairman—Halmond Parks, Aerojet-General; and treasurer—Martin Saltz, Hughes Aircraft Co. John Blakely, Firestone Guided Missile Div., is a holdover secretary filling out the balance of his two year term. The meeting location, which has been at Rodger Young Auditorium for the last few years, has been changed for next year to the Carolina Pines Restaurant to take advantage of the lower dinner prices.

The May meeting featured several speakers. One of them was recently retired Admiral Larry Baldauf, Aerojet-General Corp., who spoke on the history of QC in Naval Ordnance. The second speaker was James Buehler, North American Aviation. Mr. Buehler presented "Purchasing, engineering, and QC in vendor-vendee relations."

LOUISVILLE . . . The meeting of May 4 was the last of the season. The business centered around two events that all our members are looking forward to with great expectation—the Louisville Engineering & Scientific Council Banquet (our section is host), and the Midwest QC Conference that is to be held in nearby French Lick, Ind. in September. As part of the Council's banquet, section chairman Joe Lipps will make the welcome address, present awards to two college students for outstanding academic achievements, and present a plaque to the University of Louisville for its continued progressive interest in QC education.

Pat Dellario introduced Albert Osse, the speaker for the evening. Al is an active member of the section and is a member of the production engineering staff at General Electric. He gave a very intellectual and understandable discussion on "Reliability and how it fits into our industry." Al pointed out that reliability is replacing opinions with facts.

METROPOLITAN . . . On May 12 the secton held the final meeting of a successful season. The meeting featured David Valinsky of City College of N: 'ork who spoke on "Game theory and business strategy" and Dr. A. W. Jones of Bell Telephone Laboratories who spoke on "Solution by simulation of problems involving chance variables." R. I. Wilkinson, Bell Telephone Laboratories, was moderator.

The pre-meeting clinic was conducted by Dr. Fritz Kafka, Charles Pfizer & Co., on the subject of "An introduction to the elements of operations research."

The final executive board meeting passed an unanimous vote of thanks for a job well done to its outgoing chairman, Ed Shecter.

We anticipate an informative and rewarding new season under the leadership of our incoming chairman, Mary Torrey, and wish her well.

MID-HUDSON . . . Thirty-four members and guests attended the May 12 meeting at the Governor Clinton Hotel, Kingston. Wallace Stone introduced the guest speaker, James L. Dolby of General Electric, whose topic was "Prediction control." The talk covered sales forecast, marketing problems and the effort to control by prediction through the establishment of QC.

William Bobalke, chairman of the nominating committee, reported on the results of the annual election. The new officers are: William Cranston, chairman; Gerald H. Overbagh, 1st vice chairman; William A. Beneshan, 2nd vice chairman; Richard A. Hulnick, treasurer; and Casper J. Rose, secretary. The new chairman, William Cranston of Western Printing & Lithographing Co., then announced the following appointments: publicity—Sidney Price, membership—Walter W. Wagner, and program—Armand J. Bosse.

MILWAUKEE . . . The annual business meeting was held on May 4 at the Pabst Blue Ribbon Hall. Following a tour of the Pabst Brewing Company's bottling plant, the annual reports of section officers were heard. A report of the tellers committee indicated that new officers for the coming year are as follows: chairman—George Grayeraft, Dynex, Inc.; vice chairman—Larry Neuman, Miller Brewing Co.; treasurer—Larry Linson, Bucyrus Erie; secretary—Darrell Schroeder, Globe Union, Inc. Copious quantities of beer, with cheese and crackers, was enjoyed by all present.

MUNCIE . . . May 21 marked the last meeting of the season. Leo J. Nartker, Delco Products Div., GMC, spoke on "Linear correlation." It proved to be a very interesting subject in the hands of a skilled practitioner.

The newly elected officers were introduced at this meeting. They are: chairman Clifford B. Johnson, vice chairman

Si Collier Retires

July 1 marked the end of some thirty odd years of service with the Johns-Manville Corporation for Simon Collier who retired.

Si received his B.S. degree in chemistry at the Worcester Polytechnic Institute in 1916. After various assignments with the Boston Belting Company and the National Bureau of Standards, he joined the Johns-Manville Company in 1923 as manager of the inspection & control department at their Waukegan, Illinois plant. In 1946 he was appointed director of quality control at the company's home office in New York, the position he held at the time of his retirement.

He has held the following executive positions with ASQC: executive secretary for the terms 1948-49, 1949-50 and 1950-51; vice president for the term 1951-52; and president for the term 1952-53.

Mr. Collier is chairman of committee D-11 on rubber-like products and chairman of committee E-11 on quality control of materials of the American Society for Testing Materials and is also a member of the American Chemical Society and American Institute of Chemists.

Si resides at 222 Centre Avenue, New Rochelle, New York.

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Chemical Division Sponsored Course

The Chemical Division will sponsor a course in "Statistical Methods for Process Development" at the University of Western Ontario on Aug. 10-21. The course is being held in cooperation with the Graduate School of Business of the university.

Richard E. Dix, secretary Gerald A. Rude, and treasurer Dale J. Helms.

NORTHEAST TENNESSEE . . . On Apr. 7 a group of 111 were present when Warren Purcell presented the charter to the section at the Tennessee Eastman Research Auditorium in Kingsport. After the presentation, Mr. Purcell spoke on "Who controls quality—and how?"

The May 11 meeting was held at the Hotel Bristol, Bristol, Va. Cuyler J. Hawks, Eastman Kodak Co., discussed the flow of product in the assembly area (output of the process), the application of control charts to such flow, and various methods for reporting control chart data including graphical presentations involving high speed computers.

PHILADELPHIA . . . The closing meeting of the season was a joint dinner meeting with the Society of Women Engineers and was held at the Germantown Cricket Club. The attendance was over the fifty mark and the event proved to be a big success. Robert Schin of the Western Electric Co. delivered a timely presentation on the subject "Can QC pay its own way?" The talk certainly pointed out the key fact that the acid test in the success or failure of an over-all QC program in the eyes of management is the Dollar $ign and more specifically how much did it save? Mr. Schin impressed the gathering by tracing the growth pattern of the QC organization at Western Electric.

PITTSBURGH . . . The feature of the May 19 meeting was a plant tour of the open hearth shop of the Jones and Laughlin Steel Corp. Seventy-five members and guests were conducted through the shop by members of the metallurgical staff who were very familiar with the operation and answered all questions. Part of the tour also included some of the rolling mill where sheet steel is produced.

The results of the election of officers for 1959-60 are: chairman—Duncan C. McCune, Jones and Laughlin Steel Corp.; vice chairman—William I. Martin, Koppers Company; secretary-treasurer—Edward J. Boyle, Bloom Engineering Co.

PITTSFIELD . . . K. A. Heinold, Federal Products Corp., was the guest speaker at the May 13 meeting. His topic "Inspection and gaging" was augmented by slides and a display of various types of gages. In addition to the excellent discussion of present applications, of unusual interest was the portion of his talk describing the new gages now in the development stage.

Our basic industrial QC course graduated a class of 37 which included a number of new members. The course was extremely well managed and taught by Robert Traver of the General Electric Co. Announcement was made of the intermediate QC course to be presented next fall. Leonard Kroll, Peter J. Schweitzer Div. of Kimberly-Clark Corp., will be instructor.

ROCHESTER . . . On May 23 the food and beverage industries sub-group held an outing at Happy Acres Country Club. Approximately one hundred people had an enjoyable afternoon and evening. Those attending believe this should become an annual affair. The sub-group officers were elected. They are: chairman Henry C. Hinz, Jr., vice chairman Morton Weingarten, and secretary Donald Widman.

ST. LOUIS . . . The section has been busy with the formation of a subsection in southern Illinois. This area around Crab Lake has numerous industries in which many QC people are employed. The first meeting was held at Herrin on Apr. 11 with 33 people from southern Illinois and eight from the section. Arnold Braun of the section gave an interesting talk on "Management of QC."

The subsection group met in May at the Universal Match Corp. plant at Marion for an organizational meeting and nominated officers to handle the business affairs of the subsection. Considerable credit is to be given to John Bredfeldt, Cliff Statler, and others in the southern Illinois area as well as to Milton Weiss, subsection coordinator of the section, for the responsibilities in formulating another future ASQC section.

SAN ANTONIO . . . James R. Gilman, Bay State Abrasive Products Co., was guest speaker at the May 12 meeting. Mr. Gilman presented a paper on "The Bay State quality assurance program." It was centered around the QC program in effect at Bay State and was supplemented with graphs and charts which depicted the use and effectiveness of the plan.

With this meeting the season has come to a close. The section is indeed proud to say that if it were not for the Texas "circuit tours" our most successful season could not have been realized. From the responses already received from speakers slated for the next season, it appears that another successful season will be experienced by the section.

The section extends sincere thanks to the outgoing officers and wishes the best of luck to the new officers in carrying out the business affairs during the next term.

SAN DIEGO . . . This year, the "July" installation dinner-dance will be held in August. (Please read further before you accuse your reporter of showing signs of strain.) Traditionally, our new officers are installed in July. The accent is

PHILADELPHIA—Robert Schin of the Western Electric Co. was guest speaker at a recent meeting.

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- What ASQC is Doing for the Quality Control Engineer
- The Reliability Efforts of Test Engineering at the Air Force Missile Test Center
- Quality Control in Rubber Manufacturing
- Bulk Sampling
- Transformation of the Independent Variable
- Production Vibration Processing
- Standardization of Quality Control Terms and Symbols
- Reliability, Quality Control and Simulation
- Quality Control and Reliability of Military Equipment
- Latent Reliability—An Approximation Method
- Process Control of Continuously Extruded Product
- On Sampling Inspection Plans
- Progress in Air Force Quality Control
- Management of Convair-Astronautics Reliability Programs
- Quality Assurance Environmental Testing
- Total Quality Control
- Process Control of the Continuously Extended Product
- Sensory Testing
- A Five Variable Multiple Correlation Study on Univac I
- Ford's Quality Audit Program
- Quality Control Applications in the Oil Refining Field
- Multiple Correlation for Processing Quality Control Data on a Digital Computer
- Quality Problems Encountered in the Naval Nuclear Propulsion Program
- Quality Control "from the Ground Up"
- Air Force Quality Control Activity in Reliability
- A Statistical Quality Control Approach to the Selection of Flavor Panel Members
- Vendor Quality Rating Procedure
- Navy Progress in Quality Control for 1958
- Continuous Forecast Correction in Planning Production in the Apparel Industry
- The First Four Moments of a Frequency Distribution and a Plot of the Distribution
- Randomized Incomplete Blocks
- Quality Engineering Applied to Incoming Material
- Control of Quality of Sheet Metal Materials for Containers
- Sensitivity and Efficiency of Experimental Design
- Use of Operations Research in Western Electric Company
- Quality Control Applications in the Job Shop
- The Mixed Weibull Distribution in Life-Testing of Electron Tubes
- Defense Inspection Policies as Applied to Military Subsistence
- Summary of Extremo-Value Theory and its Relation to Reliability Analysis
- Army Progress in Quality Control During Calendar Year 1958
- Food Processing Decisions by Multi-factor Analysis
- An Organized Approach to Reliability
- An Industrial Engineer Looks at Statistical Controls
- The Challenge of Reliability
- Quality Control Engineering in New Design
- Will He Take It?
- Quality Control Applications in Stampings, Welding and the Job Shop
- Specific Quality Problems in the Manufacture of Components for Nuclear Power Plants
- IBM Data Processing Equipment as Applied to Quality Control
- A Quality Control Application in the Job Shop
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- The Role of Product Engineering in Automotive Quality
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Worcester Section Salutes Charles J. Hudson

Charles J. Hudson, an ASQC Fellow, has been elected a Fellow in the American Association for the Advancement of Science. "Charlie", as most people know him, was the first chairman of the section and is a Founding Member ASQC, past National Director — Boston section, and has served as chairman of various National committees.

Upon graduating from Amherst College in Massachusetts in 1911, he taught at Amherst for a year, and then transferred to the University of Pittsburgh, where he did research work in Astronomy in addition to teaching.

In 1917 he left the academic field to work in the Norton Company Research laboratory. He was appointed quality manager in 1935 and quality consultant in 1951, until his retirement in 1952. Retirement is perhaps a misnomer as Charlie was promptly engaged as part time quality consultant by Miniature Precision Bearing Co., Keene, N. H.

It appears that Charlie in semi-retirement is busier now than ever. Besides faithfully supporting his section he travels extensively back and forth across the nation fulfilling speaking engagements. Invariably we find his charming and friendly wife accompanying him in his travels.

Charlie is also a member of the ASTE, AAS, TACS (Member Emeritus), ASQC, Worcester Engineering Society and is a registered professional engineer.

We in Worcester congratulate Charlie and are proud to have him as a member and friend.

on festivity rather than solemnity (especially for the outgoing officers), hence the annual dinner-dance. Having selected the terrace of the Kona Kai Club for the site, your executive board found that the date depended on availability. The coincidence of "July 4" and the first Saturday limited the choice. We settled for Saturday, Aug. 1. The program includes a sumptuous buffet, soft music and (hopefully) moonlight. More specific details will be found in the formal announcement to be mailed to the member's spouse.

SCRANTON-WILKES BARRE . . . Members who attended the May meeting heard a talk and discussion on "Analysis of variance" led by Eugene Krauter, General Electric Co. He thoroughly explained the steps of the "span plan" as applied to the manufacturing process.

SOUTH TEXAS . . . James R. Gilman of Bay State Abrasive Products Co. presented "The Bay State quality assurance program" at the May 13 meeting. Their program utilized to the utmost the human aspects of QC and their excellent results confirm the validity of this technique in this industry.

A pre-meeting training session was conducted by Erwin Neville. The discussion of "How do you round off numerical values" was well attended and evoked a lively discussion on specifications.

SYRACUSE . . . A considerable group from the section attended the annual convention in Cleveland. One of the group, Dr. Martin A. Brumbaugh, was a moderator at one of the sessions.

TORONTO . . . The May 6 meeting featured Paul Goddard of Scripto of Canada, Ltd. He gave a most interesting and informative exposition of process controls employed during the manufacture of his company's products. Members and guests showed considerable interest in an outline of various methods of analysis which were scheduled for implementation in the immediate future.

On the occasion of our ladies' night on May 20, the guests and their escorts spent a pleasant evening enjoying the hospitality of the Bell Telephone Company of Canada. A conducted tour of the Walnut exchange provided an impressive insight into the intricacies of a modern, automatic telephone exchange and the evening concluded with the serving of refreshments in the Employees' Cafeteria.

UNIVERSITY OF WESTERN ONTARIO . . . At an executive meeting held on May 27 the coming year's program was outlined. The management night meeting is scheduled for October to be followed by training courses in Kitchener and London in November. Concurrent meetings are to be held in London and Kitchener during the winter months.

UTICA . . . The season came to a close with the annual ladies' night and installation of officers banquet at Harts Hill Inn. Officers installed were: chairman Roy Milton, vice chairman Don Tarrant, secretary Sam Roberts, and treasurer Joe Burek.

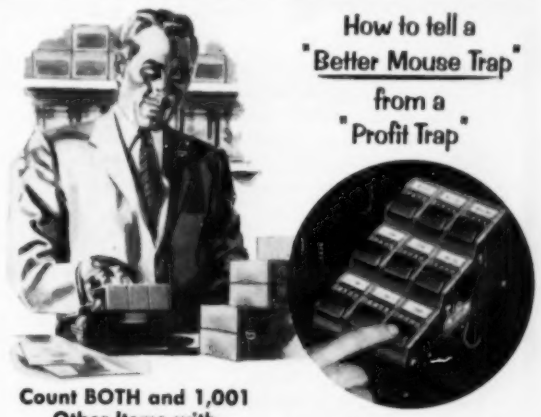
The feature of the program for the ladies was a talk by L. M. Parker of Oneida, Ltd., manufacturers of the well known "Community" silverware. Mr. Parker showed slides which showed that quality not only goes into the product at Oneida but is the theme for the company's relations in the community where it is located. Oneida's plant is one of the few where the architecture of the plant is in the Ivy-league tradition. Each lady present received an attractive cake server.

YOUNGSTOWN . . . An unexpectedly large turnout made the May meeting the largest of the year. More than thirty couples celebrated the annual Ladies' Night with a delicious smorgasbord served by personnel of the U. S. Air Force base in Vienna. Favors were persented to the ladies and also to the men. After dinner the group was taken on a guided tour of the jet base and its facilities.

During the business meeting James C. Martin of General Electric reported the results of the recent election of officers. Chairman Robert V. Jones of Copperweld Steel presided during the installation ceremony and welcomed the new officers. They are: chairman—Paul D. Belter, Trumbull Lamp

Richard P. Pilger

It is with the deepest regret that the Utica section announces the passing of Richard P. Pilger on May 18. Mr. Pilger, past section chairman, was a vendor contact specialist in General Electric's radio receiver department in Utica.



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plant; vice chairman—Ronald A. White, Trumbull Lamp plant; secretary—William S. McHenry, Ohio Lamp plant; and treasurer—Fred Eboch, Graphite Products Corp.

SIGNIFICANT DIFFERENCES

. . . Boston—**Warren Purcell** has been promoted from QC manager of the Lowell plant to director of QC for the entire Raytheon Mfg. Co.

Robert J. Lockart is now QC manager for National Co. Inc., and National Radio Company (a wholly owned subsidiary).

A. E. (Ted) Brownrigg has moved from the Raytheon Mfg. Co. to National Co. Inc., and National Radio Co. as senior QC engineer.

John Donald has been promoted to QC supervisor for Monsanto Chemical.

CALL FOR PAPERS

1959 Eastern Joint Computer Conference

The 1959 EJCC, sponsored by AIEE-ACM-IRE, will be held at the Statler Hilton Hotel in Boston, Mass., on Dec. 1-3. Papers will be accepted on any phase of computing. Persons wishing to present papers must submit by *Aug. 15* four copies of a 100-word abstract and a 1000-word summary. Present plans call for a single session conference and papers will be limited to a presentation time of 20 minutes followed by a brief discussion period. Abstracts should be suitable for inclusion in the program of the conference.

Abstracts and summaries should be sent by *Aug. 15* to: J. H. Felker, chairman, EJCC Program Committee, Bell Telephone Laboratories, Mountain Avenue, Murray Hill, N. J.

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. . . Charleston—**R. M. Berg,** Union Carbide Chemical Co., was elected District 8 representative.

. . . Dallas-Fort Worth—Our congratulations to **James L. Coburn** of Convair and **H. B. Epstein** of Chance Vought who have recently been selected as Fellow members.

ASQC tie bars were presented to **Jim Ramsey** and **Henry Mulholland** for their sponsorship of the greatest number of new members. Recognition was also given to **Joe Fasnacht** and **Scotty Harper** in the membership drive competition.

Special congratulations go to **Eugenia R. Wingfield** upon election to her sixth successive term as section secretary. Eugenia is a faithful and active section member.

. . . Kansas City—**Cliff Cutler** has been promoted to QC department supervisor at Hallmark Cards, Inc.

. . . Los Angeles—**Robert L. Jackson** has been appointed production manager for the scientific and process instruments division of Beckman Instruments, Inc.

Ray Primmer has left Hydro-Aire to become president of QRA, Inc., a QC and inspection services organization.

Don Brewer was recently promoted to quality manager of the communications division of Hughes Aircraft Company.

Glenn Ghormley was recently promoted to manager of management research of Cannon Electric Co.

Emil Olson, Air Research Corp., 9851 Sepulveda Blvd., Los Angeles 45, Calif., has done a fine job as employment chairman this last year. Anyone desiring employment in QC in the Los Angeles area should write to Emil at the above address. He has many listings for management and QC engineering and inspection and test.

. . . Northeast Tennessee—**Dr. Hubert M. Hill,** section chairman, presented a lecture "Design of experiments in modeling in complex weapon systems" to the research and development class of the 9922nd Air Reserve Squadron on May 4.

Haswell Dean, formerly with Raytheon, Inc., is now with John Oster Mfg. Co., McMinnville.

John Carriker, formerly with Raytheon, Inc., is now with John Oster Mfg. Co., Racine, Wis.

. . . Pittsburgh—**Sidney S. Lewis** has joined Jones and Laughlin Steel Corp. as a staff statistician. He formerly was with American Metals Refining Corp.

R. Maggio has taken a position as senior operations research engineer with National Steel Corp., Wiertown, W. Va.

. . . Scranton-Wilkes Barre—**Clyde L. David,** immediate past chairman of the section and QC manager at Kanarr Corp., has accepted a management position with the Electric Auto-Lite Company, Hazleton.

John Lautz, one of the section's charter members, has transferred to the office of the U. S. Naval Inspector of Ordnance in Washington, D. C.

. . . State University of Iowa—**Wayne M. Biklen** was promoted to the position of manager of operations for the American Safety Razor Products Corp.

. . . Tennessee—Section chairman **Pete Littleton** recently gave a talk to the State of Tennessee Pilots Club in Knoxville.

R. D. Smith was guest speaker at March meetings of the Knoxville chapters of the National Machine Accountants Association and the Society of Industrial Engineers.

Prof. **David Chambers** spoke on QC at March meetings of the Winston-Salem, N. C. Supervisors' Club and the Tri-Cities chapter of AIIE.

. . . Tucson—**Keith S. Pilger** has transferred from Hughes Aircraft Co., Tucson Missile Division to Hughes Products Group, Los Angeles.

Warren R. Clemens, section vice chairman, has transferred to the Hughes Semi-Conductor Division, Costa Mesa, Calif.

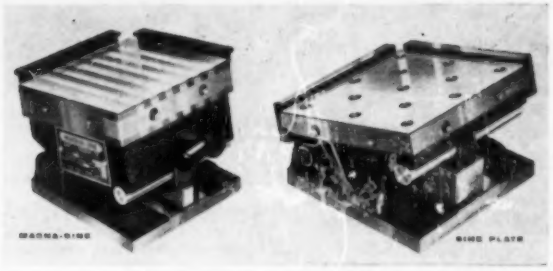
. . . Toronto—The education committee has announced its intention to sponsor two extension courses at the University of Toronto from September 1959 to March 1960. The two series, running concurrently, will provide a basic and elementary course in the use of QC tools and a more advanced course in SQC and elementary statistics.

The annual election of officers was held on Apr. 8. The results are: chairman **R. de la Rosa,** vice chairman **J. E. Boardman,** secretary **Jas. Butler,** and treasurer **S. Brodsky.**

. . . Utica—New officers for 1959-60 are: chairman **Ray Morton,** vice chairman **Don Tarrant,** secretary **Sam Roberts,** and treasurer **Joe Burek.** All of the new officers are with General Electric—so if you want a quality product, you know who to buy it from.

What's New?

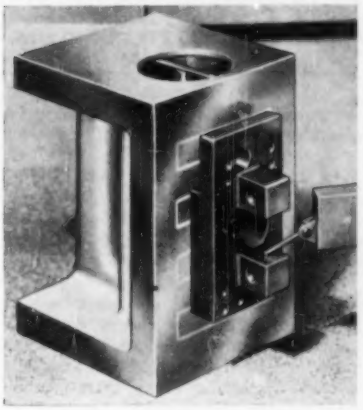
ROY A. WYLIE, *Editor*
Ampex Corporation



P-7-1—A new small size in magnetic and non-magnetic sine plates has been announced by the Omer E. Robbins Co. These smaller size sine plates have a 4 × 4 inch working area and provide all the time-saving, accurate angular set-up features found in larger equipment. The Magna-Sine table has a strong, fine pole, permanent magnet chuck that firmly holds small work without distortion. The non-magnetic Sine Plate table has a ground surface and tapped holes for convenient clamping of work. These two sine plate models permit rapid angular set-up of small to medium size work for grinding or inspection operations. While these new sine plates are designed for single angle set-ups, compound angles can also be quickly set up by combining either two Magna-Sines, a Magna-Sine with a Sine Plate, or two Sine Plates.

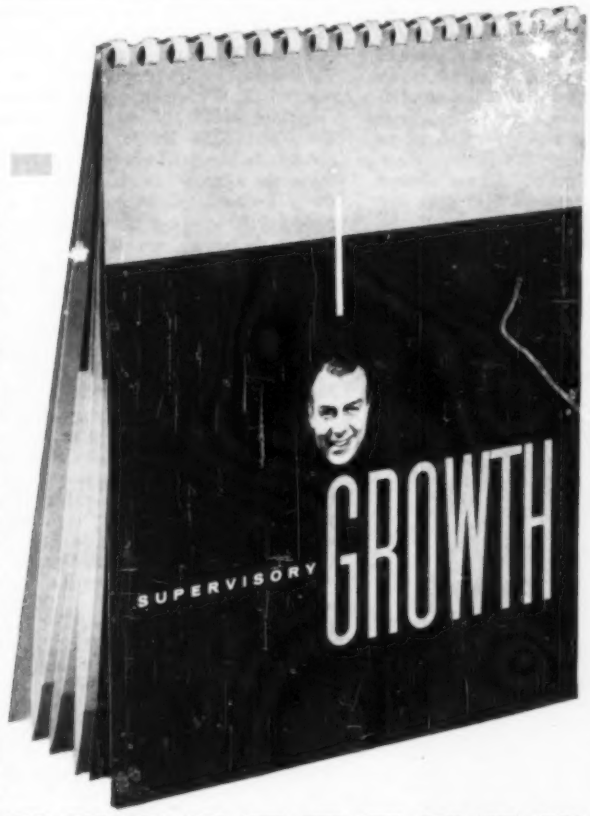
★ ★ ★

P-7-14—A new magnetic angle iron developed to speed and simplify layout and inspection has been announced by the Taft-Peirce Manufacturing Company. The Magnetic Angle Iron combines the advantages of a universal right angle iron with a magnetic chuck to eliminate the lost time and inconvenience of work clamping. A 90 degree turn of a recessed control bar energizes a magnetic face plate. By turning the control bar 25 degrees, a special "fringe" magnetic setting is produced which allows the workpiece to be easily adjusted by hand to the final location before full holding power is applied by a complete 90 degree turn. The magnetic angle iron can be turned



Send for Information

Additional information regarding new products or new literature items appearing in the "What's New?" department can be obtained by writing in the key number of the item in the Product Education Service coupon which appears on page 38.



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3rd Annual Chemical Division Technical Conference

The Third Annual Chemical Division Technical Conference will be sponsored by the Chemical Division of ASQC at the Shamrock Hilton Hotel, Houston, Tex., Sept. 24-25.

The Division offers this program to help solve some of the problems of the chemical and process industries. To round out the program there will be a pre-conference open house, a training session, outstanding luncheon speakers, and evening entertainment.

Luncheon speakers will be Willis M. Tate, president of Southern Methodist University, and R. G. LeTourneau, founder and president of the LeTourneau Foundation.

The training session will review the basic statistical computations and theory of regression analysis, analysis of residuals, and ANOVA with emphasis on components of variance.

For further information, see advertisement, page 33, this issue, or contact K. K. Keneaster, publicity chairman, Chemical Division Training Conference, Uncle Ben's, Inc., P.O. Box 1752, Houston 1, Tex.

on its side, on its back, or its ends for checking work in different positions with reference to a surface plate. Faces, side and ends are precision ground, square and parallel within 0.0002 inch. Overall dimensions are: 4¾ inches long, 4¼ inches wide, 6½ inches high, approximate weight 18 pounds.

★ ★ ★

P-7-6—Deviations as small as ten-millionths of an inch in the curvature or contour of inner and outer bearing races can be detected by the new Accutron Electronic Gage recently announced by The Sheffield Corporation. The instrument can be used also to inspect the radius of other types of precision parts. Equipped with standard components, the gage checks race curvature of inner and outer bearing rings from ⅜ to 6 inch outside diameter, ball size from 1/16 to ⅝ inch diameter. With additional components for miniature bearings, inner rings with outside diameter from 0.050 to 0.500 inch, and outer rings with inside diameter from 0.075 to 0.500 inch can be checked. A counterbalanced swing arm with a frictionless-type Electrojet gage cartridge and pickup stylus mounted to the lower member, sweeps the curved surface of the bearing with extremely light but constant pressure. The swing arm rotates through the gaging arc on solid bearings ground and lapped to an accuracy of five millionths of an inch on diameter and straightness.

★ ★ ★

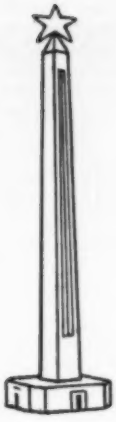
P-7-12—The Splinedicator, developed by Vinco Corporation represents a radical departure from the customary methods of gaging splined shafts. The Splinedicator combines the function of five gages, replacing the Go and No-Go composite rings and master plugs for each. It also answers the previously unsatisfied demand for a master ring to check the spline gage for the internal spline. The indicator of the gate is set by means of a master setting plug of verified tooth thickness. The Splinedicator gives an accurate check of the "effective tooth thickness", eliminates human error, shortens inspection time, detects back taper, affords unlimited gage life, and is adaptable for semi-automatic gaging. Accuracy is consistent, repeating in the same index position with the master within 0.00005 inch; repeating in any index position with the master within 0.0001 inch. There is no loss of part tolerance due to gage tolerance because the tooth thickness of the set master is known, permitting exact part limits to be established on the dial indicator. This feature makes the splinedicator indispensable for the inspection of parts with close limits.

★ ★ ★

P-6-10—A new concept in Bridge design was recently announced by General Resistance, Inc. to make possible ultra-high precision measurements at production speeds. The General Resistance "Go-No-Go" Wheatstone Bridge makes possible the precise measurement of resistors to 0.0035 percent accuracy. This instrument has a sensitivity of 0.0005 percent and has a 6-dial decade corresponding to 0.0005 percent resolution, thus enabling the maximum utilization of both factors. It operates as a go, no-go limit bridge from 100 ohms to 11.111 megohms with full scale tolerance selections of from 0.01 percent to 10 percent and from one ohm to 111.11 megohms with full scale selections of 0.1 percent to 10 percent. The Go-No-Go Bridge may also be used as a standard Wheatstone Bridge from one ohm to 111 megohms. Both the associated galvanometer and D.C. power supply are supplied internally.

★ ★ ★

P-6-11—Two brand new instruments, for use in standards laboratories, have been introduced by Wayne Kerr Corp. For accurate comparison of an unknown impedance, the Precision Low Impedance Comparator, B-821, is similar to instruments supplied to the British National Institute of Oceanography for studying salinity of sea water, as part of the International Geophysical Year Program. The design is based on a three-terminal transformer ratio-arm bridge circuit giving a very high degree of stability and discrimination. This Comparator compares impedances in the order of 1,000 ohms against a known standard with an accuracy of 0.001 percent and covers ratios between standard and unknown of 0.8:1 and 1.2:1 in steps of 0.00001. An external audio-frequency source and detector are required. The maximum effective impedance, looking back into the bridge, is a few milliohms; measurement frequency can be between 500 cps and 5 Kc. Wayne Kerr has also introduced its new Abso'ute Standard of Low Capacitance, developed to provide a suitable absolute



Building a Tradition

The Chemical Division – ASQC announces its

THIRD ANNUAL TECHNICAL CONFERENCE

September 24-25, 1959, Houston, Texas
Shamrock-Hilton Hotel

Following in the paths blazed by its two predecessors, the Third Annual Conference presents outstanding papers by recognized authorities on the use of Statistics in Experimentation, Research, Development, and Process Control.

Learn the latest about Response Surface Methodology, Evolutionary Operations, Transformations, "Quick and Dirty" Techniques, Variance Components, Control Charts for Chemical and Continuous Processes, and MORE.

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Southern Methodist University

Mr. R. G. LeTourneau, President,
The LeTourneau Foundation

An Exotic "Hawaiian Evening" at the beautiful Shamrock Terrace swimming pool.

For further information clip and mail to: K. K. Keneaster, Publicity Chairman, Chemical Division Technical Conference, Uncle Ben's, Inc., P. O. Box 1752, Houston 1, Texas.

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standard to avoid use of substitution methods of measurements. For use in standards laboratories where an absolute standard capacitor is required, this instrument is constructed to a value of 10 μ, accurate to 0.01 percent. Ratio transformers can provide multiplying factors without loss of accuracy so that a standard impedance of any desired value can be effectively produced from the single standard. The new Wayne Kerr Absolute Standard Capacitor is a bridge which solves the problems of precise measurement of very high impedances, which have resulted from the extension of the three-terminal bridge technique.

★ ★ ★

P-6-12—Announcement of the Microcorder extends the Micrometrical Line

Rutgers Advanced Conference

A six-day advanced conference series on "Applied Statistics and Quality Control" will be offered in New Brunswick, N. J. *Sept. 9-16.* This advanced course provides additional instruction for persons who have had both a basic course and industrial experience in the SQC field.

The series is designed to meet the needs of industries by providing their representatives with a practical working knowledge of modern quality control methods. Sufficient basic theory is presented to provide a sound over-all training—the emphasis will be upon the application of techniques and principles useful in isolating and solving important plant problems and in developing and establishing a broad, integrated quality control program.

The 1959 Series is designed for two categories of experienced men from industry who will meet together the first three days and then separately the last three days.

Category A: Present and prospective quality managers. This group will conclude the Series with the three-day Management Workshop.

Category B: Research scientists, industrial statisticians, and internal statistical consultants. This group will conclude the Series with three days devoted to Design and Analysis of Industrial Experiments, including designs appropriate to the chemical indusrty.

PROGRAM

First three days: (both groups meeting together)

Review and extension of control chart concepts, including narrow-limit gaging.

Identifying important assignable causes: strategies for interpreting data. "Trouble-shooting" and process-improvement techniques

Analysis of Means

Setting specifications—some principles

Variables sampling plans

Introduction to correlation and regression analysis

Last three days—Category A: Management Workshop

These will include seminar type sessions based on discussion of case problems and presentation of individual problems in specific areas of quality control from the viewpoint of management principles and interest.

Last three days—Category B: Design of Experiments

Principles and Techniques of Experimentation in Development and Research.

Planning the experiment; analysis and interpretation of experimental data.

Regression and correlation's factorial experiments; fractional factorial will be presented and discussed. An introduction to response surface methods (Box-Wilson) and evolutionary operation (EVOP) will be presented.

The presentation will include demonstrations, lectures, and discussions of actual plant experiences.

An important part of the series will be opportunity for registrants to discuss their individual industrial problems with members of the Conference Staff.

The Rutgers staff members, who will be associated with this Advanced Conference, are Professors Ellis R. Ott, Mason E. Wescott, Martin B. Wilk and Harold F. Dodge. Professor Paul C. Clifford (Montclair State College) will direct the Management Workshop.

The staff will be further supplemented by the participation of industrial men with effective experience including Richard S. Bingham, Jr., Carborundum Company; Enoch B. Ferrell, Bell Telephone Laboratories; and Truman L. Koehler, American Cyanamid Company.

Tuition is $150 which includes text and instructional material. For additional information write to Professor Ellis R. Ott or Professor Mason E. Wescott, Rutgers · The State University, New Brunswick, N. J.

announcing . . .

. . . New American Standards

The work of the Standards Committee of ASQC has resulted in the revision of several American War Standards (Z1.1-1941, Z1.2-1941, Z1.3-1942). These war standards have been revised, rehashed, and revised again. ASQC circulated these revised standards in a survey of organizations having a substantial interest in quality control. After further review of the war standards, in light of knowledge gained from the survey of industry, ASQC submitted the standards to the American Standards Association for approval as American Standards. The American Standards Association approved the standards as American Standards on November 21, 1958. . .

. . . and now they are available for you!

ASQC Standard B1-1958, "Guide for Quality Control"

ASQC Standard B2-1958, "Control Chart Method of Analyzing Data"

These are revisions of AWS Z1.1, Z1.2-1941, and have been approved as ASA Z1.1, Z1.2-1958.

Available in 28-page covered volume $2.25

ASQC Standard B3-1958, "Control Chart Method of Control Quality During Production"

This is a revision of AWS Z1.3-1942, and has been approved as ASA Z1.3-1958.

Available in 36-page covered volume $2.50

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. . . . . copies, ASQC Standard B3-1958 (ASA Standard Z1.3-1958) @ $2.50 per copy

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of surface finish measuring instruments to include the measuring and recording of the roughness profile of a surface. The Microcorder is portable and can be moved from place to place within the production department or laboratory and set-up in any convenient location near to the parts which are to be measured. It is particularly important for studying surfaces which are pitted, porous, have flaws, scratches or other irregularities.

★ ★ ★

P-7-8—A new portable magnetic inspection system for detecting surface and sub-surface defects in ferrous metal parts and assemblies is offered by Ferro Machine & Tool Corp. Known as Detectascope, it is designed to locate invisible discontinuities such as deep sub-surface cracks, laps, voids, grinding, welding and heat treating cracks, even through painted or plated surfaces, without damage to the part or danger to operator. The unit also demagnetizes the part after inspection. The Detectascope consists of a removable electromagnet and demagnetizer unit with a handle, extension cord, foot switch; black light hood assembly, transformer, 5 gallon tank, agitating pump, and voltage regulator, all mounted on a mobile cabinet. The unit plugs into a 110 volt outlet. The electromagnet is placed on the part to be explored, or small parts may be brought to the electromagnet station. Current is turned on with a foot switch and the area to be inspected is painted or sprayed with an oxide solution from the tank. Iron particles in the solution concentrate whenever there is a defect. The part may then be demagnetized with the same unit. Since only magnetic lines of force are employed in the inspection, there is no possibility of burning, arcing or heating the part being inspected. The unit is 52¾ inches high, 36 inches wide and 18½ inches deep. Weight is approximately 150 lbs. and the price is $795.00.

★ ★ ★

P-6-13—Thwing-Albert Instrument Co. is now producing a heavy duty Torsion Tear Tester to measure tearing strength of strongly directional materials which tend to tear at an angle from the application of force. The Torsion Tear Tester holds the specimen rigidly throughout its entire length on both sides, and the tearing force is directed to produce a tear down the center line of the specimen. The Torsion Tear Tester is ideal for measuring the tear strength of cylinder board, corrugated board, glass fiber reinforced gummed shipping tape, vinyl and rubber sheeting, gauze and other woven fabrics.

★ ★ ★

P-7-16—A new family of portable tensile testers has been developed by Steel City Testing Machines, Inc. for making tensile tests on round or flat specimens anywhere. These testers are not dependent on outside power of any kind,

ELECTRONICS DIVISION NEWS

Past Chairman of Division Honored

Twenty-six members of the Division attended the dinner and annual meeting held at the Cleveland Athletic Club, May 25. Chairman Henry Schumer presented each of the past Division chairmen with framed certificates of appreciation for their insight and diligent work, which has brought the Division to its present high stature. The individuals so honored are: Leon Bass, Founder; Gus Mundel, 1st Chairman; Irv Schoeninger, 2nd Chairman.

The certificate read as follows:

The Electronics Division of ASQC presents to ..... this testimonial of Regard and Appreciation for his efforts toward the advancement of the Quality Control Profession and for his services to the Division as Chairman.

Other Division Activities

The "Production and Field Reliability Handbook" recently prepared by the Technical Publications Committee has been well received. If you have not secured your copy yet see the special announcement on page 78 of the May 1959 issue of *Industrial Quality Control*.

The Reliability Training Conference has been set for October 19-30 at Atlantic City, New Jersey. This first course will be limited to 35 registrants, so if you are interested in attending or in sending someone from your company be sure to request a copy of the course brochure (see course announcement under "Clinics, Conferences, and Courses" on page 39 of this issue).

Election of Officers and Councillors

The following officers and councillors have been elected for the forthcoming year:

OFFICERS

Chairman: G. H. Beckhart, Radio Corp. of America, Moorestown, N. J.
Chairman-Elect: H. D. Voegtlen, RCA Service Company, Rome, N. Y.
Secretary: J. L. Bemesderfer, General Electric Co., Cincinnati, Ohio
Treasurer: T. E. Smith, Texas Instruments, Dallas, Texas

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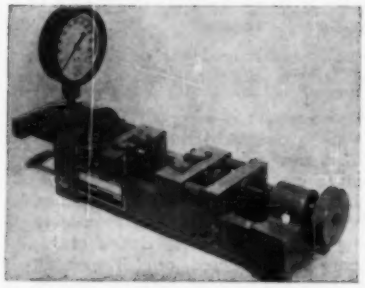
District 1: B. P. Goldsmith, Raytheon, Newton, Mass.
District 2: L. E. Floyd, General Electric, Syracuse, N. Y.
District 3: G. R. Scheel, Sonotone, White Plains, N. Y.
District 4: N. McCarthy, Westinghouse, Hamilton, Ont., Can.
District 5: J. R. Isken, IRC, Philadelphia, Pa.
District 6: A. R. Roddey, Inst. for Def. Analysis, Pentagon, Washington, D. C.
District 7: E. H. Shuttenberg, Monode, Inc., Cleveland 15, Ohio
District 8: Sherwood A. Connor, 2565 Talisman, Dayton 10, Ohio
District 9: H. I. Dwyer, Bendix, Mishawaka, Ind.
District 10: H. H. Estes, Chrysler Corp., Warren, Mich.
District 11: R. Haertel, Warwick Mfg. Co., Zion, Ill.
District 12: R. C. Roth, AC Spark Plug, Milwaukee, Wis.
District 13: R. D. Summers, Bendix, Kansas City, Mo.
District 14: J. E. Alexander, 9015 Clearwater St., Dallas, Texas
District 15: J. L. Kidwell, The Martin Co., Orlando, Fla.
District 16: J. J. Tamsen, Hughes Aircraft, Culver City, Calif.



since the load is applied manually by rotating a knurled knob. They can be carried easily because the net weight of each is only 36 lbs. The applied load is measured by a trapped-oil system. All testers in the family are designated as Model THM-, with the capacity of the specific unit added after the dash. They are available in capacities from 100 to 1000 lbs., with the applied load indicated on a 4½ inch diameter gage. For the 100 lb. model, gage increments are ½ lb.; for the 1000-lb. model, increments are 5 lb. Interchangeable wedge-type jaws are used for tightly holding flat or cylindrical specimens during tests. Jaws in three sizes cover the range of flat specimen thicknesses up to ⅜ inch. Jaws in three sizes cover the range of round specimen diameters from ⅛ to ⅝ inch. Maximum length of tests specimens is 7 inches. Over-all dimensions of the testers are: width, 5 inches; length, 23 inches, and height, 11 inches.

★ ★ ★

P-7-17—To assist in the teaching of statistical analysis and to effectively bridge the gap between the theoretical classroom and real life industrial situations, a device has been built to realistically simulate an industrial process. This "Process Simulator" has been used very effectively in the university classroom, on the production line and at ASQC conferences to teach, demonstrate and sell the use of statistical techniques. Now the student can see, quite dramatically, the effects of his statistical applications on a process and prove to himself the validity of statistical techniques. The instructor or demonstrator is able to pose many process or experimental situations for student work assignments, to emphasize various principles and to furnish convincing proof that statistical techniques are really effective.

The Process Simulator consists of various electrical circuits in a cabinet approximately 8 × 10 inches. On the front of the cabinet are: four controls for adjusting the "process", a switch to obtain a random sample (a small steel bearing) from the process, a meter for reading the various simulated measurements obtained from the sample, a switch to select various machines or operators and a switch to test various quality characteristics. Controls on the rear of the Simulator enable the instructor to select various controlling variables, control the magnitude of the process variation, adjust the bias between operators or machines, achieve either linear or non-linear effects, positive or negative regression, and change the slope of the regression between the independent variables and the observed yields. Observed variation in the dependent variables is automatically created by the Simulator and forms a normal distribution around the mean which is determined by the setting of the various controls on the front of the cabinet. By turning off the process variation, the student sees the exact solution to his statistical problem.

QUALITY CONTROL

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SENIOR MEN

Applicants should have at least a Bachelor's degree in Mechanical or Industrial Engineering with formal training in statistical quality control. Nuclear experience is not essential, but 3 to 5 years' statistical Q-C work in a metals-fabricating industry is a must.

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New Literature Available

RESEARCH HIGHLIGHTS of the National Bureau of Standards, is now available at forty-five cents per copy from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. This illustrated report scans the entire spectrum of the physical sciences as embodied in the research program of the Bureau, describing a wide range of scientific studies, laboratory experiments, and instrument developments arising from the Bureau's responsibility of providing leadership in the science of measurement. Because advances in science and technology require new and improved standards of physical measurement, the National Bureau of Standards is active at the very frontier of man's efforts to understand and control physical phenomena.

♦ ♦ ♦

Deductibility of Educational Expenses

The Treasury Department has continually maintained the position that educational expenses were of a personal nature and not deductible under existing regulations.

In two recent court decisions, several now generally accepted rules were fairly well established: school expenses to be deductible had to arise, "to maintain his present status, not to attain a new position; to preserve, not to expand or increase; to carry on, not to commence."

Basically, expenditures for education are deductible if such education is undertaken primarily for the purpose of (a) maintaining or improving skills required by the taxpayer in the performance of the duties of his employment when the educational expense was incurred, or (b) meeting express requirements of the taxpayer's employer, or the requirements of applicable law or regulations, imposed as a condition for the retention by the taxpayer of his salary, status, or employment.

On the other hand, expenditures for education are not deductible if the primary purpose for which the education is undertaken is to obtain a new position or a substantial advancement in position nor is the fulfilling of the general educational aspirations or other personal purpose of the taxpayer. Moreover, in any case, if the education is required in order for the taxpayer to meet the minimum requirements for qualification or establishment in his intended trade or business or specialty, the expense of such education is not deductible.

L-6-1—Houston Instrument Corp. has published a new bulletin on their Model HR-92 X-Y Recorder. The Recorder features a flat bed with full chart visibility using standard 8½ × 11 inch paper. The Clip-on pen is interchangeable for multicolor traces. Other features are described in the bulletin.

♦ ♦ ♦

L-6-2—A four-page illustrated bulletin describing the complete KIN TEL line of rigital instruments is now available from the Kin Tel Division of Cohu Electronics, Inc. A feature of the Kin Tel instruments is their use of fifth-digit over-ranging in all DC operations. The fifth digit, which consists of either "0" or "1" extends each four-digit range from 9999 to 19999, thus overlapping the next higher range and providing ten times the resolution normally achieved by a four-digit instrument.

♦ ♦ ♦

L-6-5—"New Products" bulletin is now available describing ten recently developed items that have been added to the line of testing apparatus manufactured and distributed by Soiltest Inc. Included in the list of items are apparatus for concrete, soils and asphalt testing, as well as the Soiltest Beggs Deformeter for solving problems involved in the design of indeterminate structures.

♦ ♦ ♦

L-6-7—The Electronics Division of DIT-MCO, INC. has published a sixty-four page brochure describing the DIT-MCO System Testing Concept in terms of participating test groups, that is, Test Planning, Test Methods, Production Test, Quality Control, Reliability Groups, and other groups concerned with testing electrical circuitry. Entitled THE DIT-MCO MATRIX CHART, the brochure contains criteria for an ideal test system, a suggested test system flow diagram and an outline for setting up the DIT-MCO Test System. Special emphasis is placed on the DIT-MCO Matrix Chart method of instantaneous fault location and test presentation. Included are pictures of circuit errors detected and located by use of the Test System.

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JULY

. . . ***26-Aug. 7***—Second Annual Institute on Missile Technology, University of Connecticut, Storrs, Conn., sponsored by U. S. Army, contact A. L. Jeffers, Box U-56, The University of Connecticut, Storrs, Conn.

. . . ***27-Aug. 14***—Special Program on Current Developments and Applications in Industrial Reliablity Problems, University of California, Los Angeles, contact Prof. Edward P. Coleman, Dept. of Engineering, University of California, Los Angeles 24, Calif.

AUGUST

. . . ***3-14***—Fourth Annual Statistical Methods in Industry Course, University of California, Los Angeles, contact Prof. Edward P. Coleman, Coordinator, Statistical Methods in Industry Course, Dept. of Engineering, University of California, Los Angeles 21, Calif.

. . . ***10***—One-week intensive short course in Statistics Methods for Research Workers in Industry and the Physical Sciences, Brevard College, Brevard, N. C., sponsored by the Institute of Statistics at North Carolina State College, contact Division of College Extension, Box 5125, State College Station, Raleigh, N. C.

. . . ***10-21—Statistical Methods for Process Development, University of Western Ontario, sponsored by Chemical Division of ASQC.***

. . . ***17-27***—12th Annual Intensive Course in QC by Statistical Methods, University of Michigan, Ann Arbor, Mich., contact Prof. C. C. Craig, 106 Rackham Building, Ann Arbor, Mich.

. . . ***17-28***—Courses in Frontier Research on Digital Computers, University of North Carolina Extension Division, Chapel Hill, N. C., contact James G. Steagall, University Extension Division, Box 1050, Chapel Hill, N. C.

SEPTEMBER

. . . ***1-2***—Conference on Physical Chemistry in Aerodynamic and Space Flight. University of Pennsylvania, Philadelphia, sponsored by the Air Force Office of Scientific Research and the General Electric Company's Missile and Space Vehicle Department, 3198 Chestnut Street, Philadelphia 4, Pa.

. . . ***9-16***—Applied Statistics and Quality Control, Rutgers • The State University, New Brunswick, N. J.,contact either Prof. Ellis R. Ott or Prof. Mason E. Wescott at Rutgers.

. . . ***16-18***—Third International Conference, Brussels, Belgium, sponsored by the European Organization for Quality Control, contact Dr. J. D. N. de Fremery, secretary, European Organization for Quality Control, Weena 700, Rotterdam, Netherlands.

. . . ***20-25***—14th Annual Conference and Exhibit of the Instrument Society of America, Chicago, Ill., sponsored by ISA, contact ISA, 313 Sixth Ave., Pittsburgh 22, Pa.

. . . ***24-25—Third Annual Technical Conference, Shamrock Hilton Hotel, Houston, Tex., sponsored by the Chemical Division, ASQC, contact K. K. Keneaster, publicity chairman, Chemical Division Training Conference, Uncle Ben's, Inc., P.O. Box 1725, Houston 1, Tex.***

OCTOBER

. . . ***13-14***—National Training Conference, "Progress in Plastics Engineering," the Ambassador Hotel, Los Angeles, Calif., sponsored by the Southern California Section of the Society of Plastics Engineers, contact Thomas A. Bissell, Executive Secretary, Society of Plastics Engineers, Inc., 65 Prospect Street, Stamford, Conn.

. . . ***19-30—Reliability Training Course for Middle Management, Atlantic City, N. J., sponsored by the Professional Group on Reliability and Quality Control and the Electronics Division of ASQC, contact H. N. Hadley, 45 Martin St., South Acton, Mass.***

. . . ***22-23***—The Italian Association for Quality Control will sponsor a statistical quality control conference in Milan, Italy. Contact Segreteria del Convegno sul CSQ, Associazione Italiana per il Controllo della Qualita—Sezione di Milano, Piazza A. Diaz, 2, Milano, Italy.

NOVEMBER

. . . ***2-5***—11th Exposition of ARI, Atlantic City, N. J., sponsored by Air-Conditioning and Refrigeration Industry, 1346 Connecticut Ave., N.W., Washington 6, D. C.

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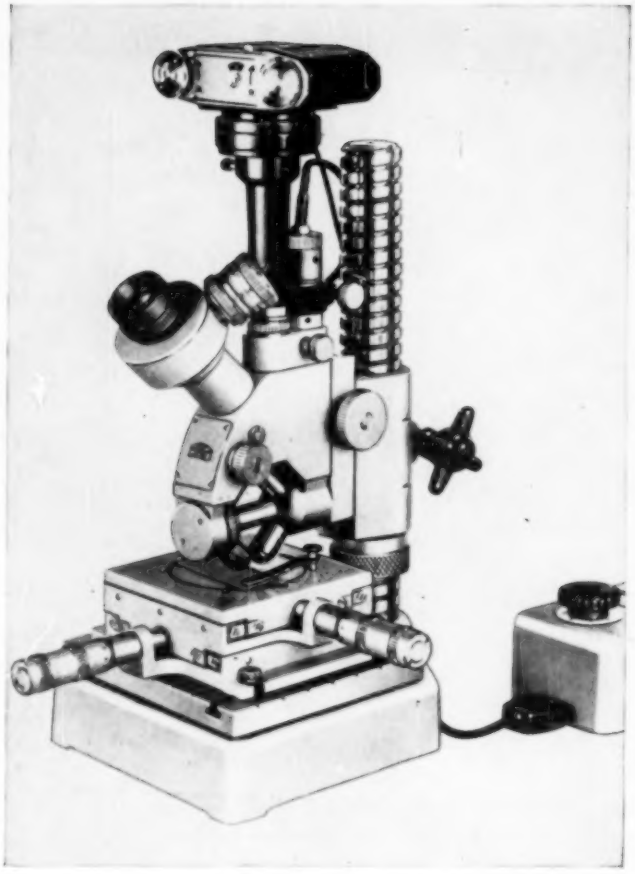

This microscope produces a profile of the surface being examined by the well known light-section method. Roughness depth, as well as the groove distances of machine-finished surfaces, can be measured. Internal surfaces can be examined by making *lacquer replicas.*

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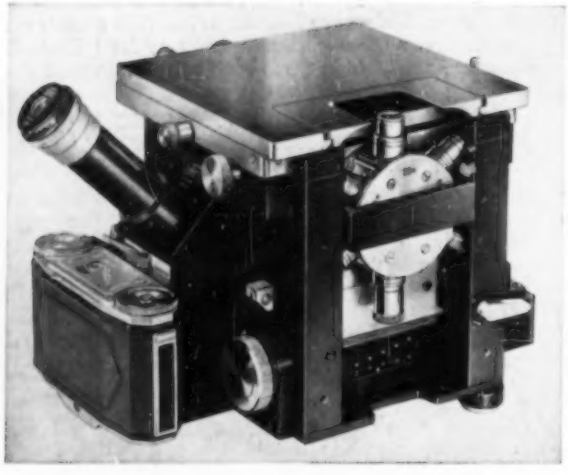

for measuring minute depths of roughness (80 to 1.2 micro inches)

This instrument, which has magnifications of 80x, 200x, and 480x, is designed especially for critical examination of super-finished surfaces, thickness of coatings, changes of surface structures due to wear, impact, stress, strain, corrosion, as well as for the studying of polished and etched metallurgical specimens.

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